

P128**[3817] - 103****S.Y. B.Sc.****PHYSICS****PH - 211: Mathematical Methods in Physics****(Paper - I) (Sem. - I) (2008 Pattern) (51211)***Time : 2 Hours]**[Max. Marks : 40**Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculators and logtables is allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) Attempt all of the following:

- a) Using hyperbolic function
Prove that $\sinh(i\theta) = i \sin \theta$. [1]
- b) $x + iy = \frac{1+2i}{1-4i}$, determine x and y . [1]
- c) Prove that $\vec{A} = 4\vec{i} - 3\vec{j} + 2\vec{k}$ and $\vec{B} = 3\vec{i} + 2\vec{j} - 3\vec{k}$ are perpendicular to each other. [1]
- d) Determine $\vec{A} \cdot \vec{B}$ for vectors $\vec{A} = 2\vec{i} + 3\vec{j} + \vec{k}$ and $\vec{B} = 4\vec{i} - 2\vec{j} - 2\vec{k}$. [1]
- e) Define unit vector. [1]
- f) Determine the constant ' α ' such that the vector
 $\vec{A} = (2x + y^2)\vec{i} + (x^3 + 3y)\vec{j} + (x + \alpha z)\vec{k}$ is solenoidal. [1]
- g) Define conservative and nonconservative force fields. [1]
- h) If $\phi = 3x^2y - y^3z^2$ find $\nabla\phi$. [1]
- i) If $F = 18xy - 17x^3 + 18y^5$ Find F_x and F_y . [1]
- j) Find degree and order of differential equation $\frac{d^2y}{dx^2} + \sqrt{\frac{dy}{dx}} + y = 0$. [1]

P.T.O.

Q2) Attempt any two of the following:

a) If $F = x^4$ show that. [5]

$$\frac{\partial^2 F}{\partial x \partial y} = \frac{\partial^2 F}{\partial y \partial x}.$$

b) Give physical significance of grad ϕ . [5]

c) Using trigonometric functions show that $\sin^2 \theta + \cos^2 \theta = 1$. [5]

Q3) Attempt any two of the following:

a) Determine the value of x and y if $x + iy = (1 + i\sqrt{3})^4$. [5]

b) Show that $\bar{A} \times (\bar{B} \times \bar{C}) + \bar{B} \times (\bar{C} \times \bar{A}) + \bar{C} \times (\bar{A} \times \bar{B}) = 0$. [5]

c) If $y = e^{-i(wt - kx)}$ show that $\frac{\partial^2 y}{\partial x^2} = \frac{k^2}{w^2} \frac{\partial^2 y}{\partial t^2}$. [5]

Q4) A) Attempt 'a' or 'b'.

a) i) Transform $z = 2\sqrt{3} + 2i$ in to polar form and exponential form. [4]

ii) Show that magnitude of cross product of two vectors represent area of the parallelogram whose sides are the two vectors. [4]

b) i) Show that $\bar{\nabla} \cdot \bar{\nabla} \phi = \nabla^2 \phi$. [4]

ii) Show that the point $x = 1$ is an ordinary point of the differential

$$\text{equation } \frac{d^2 y}{dx^2} + x^2 y = 0. \quad [4]$$

B) Attempt any one of the following:

i) show that $dF = (y^2 + y + 2xy) dx + (x^2 + x + 2xy) dy$ is exact differential. [2]

ii) If $\sqrt{x + iy} = a - ib$, show that $x = a^2 - b^2$ and $y = -2ab$. [2]

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F.Y. B.Sc. (Vocational)

**ELECTRONIC EQUIPMENT MAINTENANCE
TEST AND MEASURING INSTRUMENTS AND CONSUMER
PRODUCTS
(New Course) (Paper - I)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat diagrams wherever necessary.*

Q1) Attempt the following.

[16]

- a) What is autoranging? Give example.
- b) Define precision and accuracy.
- c) What is full-scale deflection accuracy? Give example.
- d) Compare hay bridge with Maxwell bridge.
- e) Explain importance of AC bridges.
- f) Draw ammeter diagram and give formula for designing aspect.
- g) What is service manual? Explain an importance of it.
- h) What is shielding?

Q2) Answer any Four.

[16]

- a) Explain shunt type of ohmmeter with equivalent circuit arrangement.
- b) What is pulse generator? Explain it in brief.
- c) What are advantages of Electronic voltmeter over conventional voltmeter.
- d) Explain and derive the equation for Maxwell bridge.
- e) What is burglar alarm system? Explain it in brief.

P.T.O.

Q3) Answer any Four.

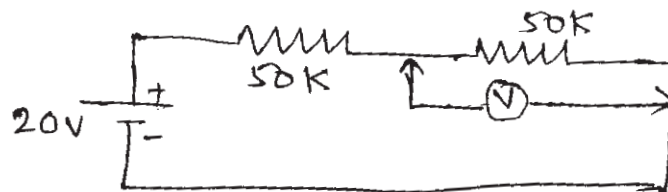
[16]

- Compare MCB with fuse.
- Write a short note on microwave oven.
- Explain role of delay line in CRO with circuit diagram of CRO.
- Explain procedural steps to remove HF noise pick-up.
- Explain object counter system with circuit diagram.

Q4) Answer any Two of the following:

[16]

- Explain home protector system and compare it with stabilizer in details.
- What is servostabilizer? Explain it in details, of each block.
- What is loading effect? How to avoid this effect? The two voltmeters are available with sensitivity $100\Omega/v$, $2000\Omega/v$ both meter uses 50v range, which meter gives less error for the following circuit arrangement?



Q5) Attempt any Two of the following:

[16]

- What is an ignition system? What are different types of it? Explain any one of the system in details.
- What is signal generator? Explain RF and AF signal generator in details.
- What is an UPS? Explain on - line and off-line UPS in details.

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F.Y. B.Sc. (Vocational)

COMPUTER HARDWARE AND NETWORK ADMINISTRATION

Essentials of Computers

(New) (2008 Pattern) (Paper - I) (48710)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams wherever necessary.*

Q1) Attempt the following.

[16]

- a) What is USB?
- b) Distinguish between flat and flat screen monitors.
- c) What is LQ/NLQ in printer? Explain it.
- d) What is the difference between CDROM and CD R/W?
- e) Write full forms of: ASCII, MICR, ALU, LASER.
- f) What is SIMM/DIMM?
- g) What are the different types of buses?
- h) What is interrupt?

Q2) Attempt any Four.

[16]

- a) Write a short note on 'Computer Generation'.
- b) Explain in brief : Keyboard.
- c) What are add on cards? Explain their use.
- d) Explain in brief: Cables and Connectors.
- e) Write a short note on 'Flash RAM'.
- f) What is Instruction Fetch & Execution? Explain the cycle with diagram.

P.T.O.

Q3) Attempt any Four.

[16]

- a) Write a short note on 'Dot Matrix Printer'.
- b) Draw block diagram of CPU and explain it in brief.
- c) What are the different I/O techniques of data transfer?
- d) What is ROM? Explain its different types.
- e) What is clock? How it is obtained in the computers?
- f) What is a 'Digitizer'? What is use of it?

Q4) Attempt any Two.

[16]

- a) Explain in brief power supply of Computer. Write short notes on home protector, stabiliser and UPS giving the difference in applications.
- b) Draw and explain functional block diagram of Computer. Write a short note on Front and rear panel of desktop Computer.
- c)
 - i) What is 'Memory mapping'?
 - ii) Distinguish between - Impact and Non-Impact types of printer.

Q5) Attempt any Two.

[16]

- a) Write a note on Memory devices in computers. Giving details of Auxiliary memory. What is main memory?
- b) Explain Microprogrammed control unit of computer with diagram.
- c)
 - i) Write a short note on 'Touch screen panel'.
 - ii) What is the relation between MAR, MBR, IP and PC with different types of buses? Explain it in brief.

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F.Y. B.Sc. (Vocational)

INDUSTRIAL MICROBIOLOGY

**Microbial Diversity & Cultural Methods & Mathematics &
Statistics for Biologists**

(Paper - II) (New Pattern) (Theory)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

(Microbial Diversity and Cultural Methods.)

Q1) Do as directed:

[10]

- A) Define the following:
 - a) SCP.
 - b) Prototrophs.
 - c) Extremophiles.
 - d) Minimal media.
 - e) Psychrophiles.
- B) Explain the following:
 - a) List methods of preservation of fungi.
 - b) List methods of storage of phages.
 - c) Importance of MacConkey's agar.
 - d) Cultivation of protozoa.
 - e) Woese's three domain classification system.

P.T.O.

- Q2)** Attempt any two of the following: [10]
- What are extremozymes? Give their applications.
 - Explain design of anaerobic jar in brief.
 - Explain the utility of dehydrated media with examples.

- Q3)** Write short notes on any four: [10]
- ATCC.
 - Methanogens.
 - Slide culture technology.
 - Barophiles.
 - Unculturable bacteria.

- Q4)** Attempt any one of the following: [10]
- What is biological nitrogen fixation? Explain cultivation of *Rhizobium* from root nodules.

OR

Diagrammatically explain the process of lyophilization.

SECTION - II

(Mathematics and Statistics for Biologists.)

- Q5)** Answer any four of the following questions: [8]
- Explain why the derivative of a constant is zero and that of e^x is e^x .
 - Intuitively and mathematically explain why the derivative of the area of a circle is its circumference.
 - State the rules for adding and multiplying probabilities giving examples.
 - Write the assumptions underlying Poisson distribution.
 - Explain why a constant is needed in integration.

- Q6)** Attempt any two of the following: [8]
- Consider the data taken from a study that examines the response to ozone and sulfur dioxide among adolescents suffering from asthma. The following are measurements of forced expiratory volume (liters) for 10 subjects: 50; 2:60; 2:75; 2:82; 4:05; 2:25; 2:68; 3:00; 4:02; 2:85g
Calculate the mean \bar{x} variance s^2 , and standard deviation s .

- b) Explain the following terms:
- Population and universe.
 - Parameter and statistic.
- c) Illustrate how continuous and discrete frequency distributions are graphically represented.

Q7) Attempt any two of the following: **[8]**

- Enlist different methods of graphical representation of data. Elaborate on the significance of graphical representations.
- Medical research has concluded that people experience a common cold roughly two times per year. Assume that the time between colds is normally distributed with a mean of 160 days and a standard deviation of 40 days.
 - What is the probability of going 200 or more days between colds? Of going 365 or more days?
 - What is the probability of getting a cold within 80 days of a previous cold?
- Write a note on degrees of freedom.

Q8) Attempt any two of the following: **[8]**

- What is the mean and standard deviation of the distribution of sample means coming from the same population?
- In an experiment on linseed, an experimenter obtained 300 seedlings in F_2 segregating in the following four classes. Detect whether the two characters under study are linked.

	Lilac petal		Deep lilac petal	
	White stigma	Purple stigma	White stigma	Purple stigma
	AB	Ab	aB	Ab
Observed frequency	200	35	35	30

- Give two measures of dispersion and discuss their merits and demerits.

Q9) Attempt any two of the following: **[8]**

- a) Write a model for describing bacterial growth under optimum conditions. What are the assumptions you made for this model?
- b) What is an equilibrium solution? Illustrate how equilibrium solution can be used to predict biomass density in a continuous culture.
- c) With any one biological example illustrate how linear programming helps in finding optimum solutions.

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F.Y. B.Sc. (Vocational)

COMPUTER HARDWARE AND NETWORK ADMINISTRATION

Computer Organisation

(New) (Paper - II)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicates full marks.*
- 3) Draw neat diagrams wherever necessary.*

Q1) Answer the following.

[16]

- a) What is Firmware? Give example.
- b) Define simulator and emulator.
- c) List any four Internal Dos Commands.
- d) CPU is brain of Computer-Explain.
- e) State functions of Interrupt Controller IC.
- f) What is USB?
- g) List the icons found on windows desktop.
- h) What is WAN?

Q2) Attempt any Four.

[16]

- a) What is application software? Explain it with example.
- b) Explain time sharing operating system.
- c) Draw block diagram of DMA interface.
- d) State important features of 80486 Microprocessor.
- e) List important features of CRT controller.
- f) Explain the e-mail utility of the internet.

P.T.O.

Q3) Attempt any Four.

[16]

- a) Define the terms:
 - i) Linker.
 - ii) Editor.
 - iii) Debugger.
 - iv) Assembler.
- b) Explain any two root directory commands.
- c) Write short note on - GPIB.
- d) What is Protocol? Why it is required in networks? List the protocols used in network.
- e) Draw block diagram of clock generator and state where it is used in computer.
- f) Write a short note on - UART.

Q4) Attempt any Two.

[16]

- a) What is Execution unit in 8086? State its functions.
- b) Explain hardware requirements for loading windows 98 and windows 2000.
- c) Draw and explain the block diagram of multimedia computer system.

Q5) Attempt any Two.

[16]

- a)
 - i) Distinguish between LAN and WAN.
 - ii) Explain need of POST in Computer system.
- b) What is control panel in windows? Explain various utilities in it.
- c) Write a short note on-Programmable peripheral interface.

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F.Y. B.Sc. (Vocational)

SEED TECHNOLOGY

Seed Physiology and Seed Production

(Paper - II) (New Course)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat labelled diagrams wherever necessary.*

Q1) Attempt the following.

[16]

- a) Define hypogeal type of germination.
- b) Enlist different causes of seed dormancy.
- c) What is seed deterioration?
- d) What are orthodox seeds?
- e) Enlist the methods to maintain genetic purity of seeds.
- f) Define foundation seed.
- g) What is land preparation?
- h) What are the basal dosages?

Q2) Attempt any four of the following.

[16]

- a) Comment on seed pelleting and coating.
- b) Describe factors affecting seed vigour.
- c) Comment on seedling abnormalities and its causes.
- d) Give the importance and causes of drainage.
- e) Comment on cure of immediately transplanted seedlings.
- f) Explain various factors affecting time of harvesting.

P.T.O.

Q3) Write notes on (any four). [16]

- a) Physiology of seed development.
- b) Synthesis of food reserves.
- c) Seed Storage.
- d) Water and nutrient management in nursery.
- e) Cropwise depth of sowing and seedrate.
- f) Sources and methods of irrigations.

Q4) Attempt any two of the following. [16]

- a) Explain invigoration treatment to improve seedling establishment.
- b) Comment on orthodox and recalcitrant seeds.
- c) Explain seed village concept.
- d) Comment on land preparation for Bajara and cauliflower.

Q5) Define seed dormancy? Describe various methods to break seed dormancy. [16]

OR

Give an importance of agronomic management in high value seed production.

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S.Y. B.Sc.

GEOGRAPHY

Gg - 211: Fundamentals of Geography of Resources

(2008 - Pattern) (Paper - I) (Sem. - I) (51811)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams wherever necessary.*
- 4) *Use of map stencil is allowed.*

Q1) Answer the following questions in two or three sentences each: **[10]**

- a) Give the definition of resources.
- b) Name any four components of natural resources.
- c) Give any two examples of renewable biotic resources.
- d) Give any two examples of non renewable abiotic resources.
- e) Give the meaning of deforestation.
- f) Write any two industrial uses of water.
- g) Write any two methods of water conservation.
- h) Write any two uses of land resources.
- i) State any two advantages of ground water.
- j) What is land degradation?

Q2) Write short notes on the following (Any Two): **[10]**

- a) Importance of renewable biotic resources.
- b) Domestic uses of water resource.
- c) Land degradation due to agriculture.

Q3) Answer the following (Any Two): **[10]**

- a) Explain the importance of the study of resources.
- b) Describe the various sources of water resources.
- c) Describe the various methods of land conservation.

Q4) Classify the resources and describe the components of human resources. **[10]**

OR

Describe the uses of forests.

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S.Y. B.Sc. (Sem. - I)

GEOGRAPHY

Gg - 212: Introduction to Hydrology

(2008 Pattern) (Paper - II) (51821)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams and sketches wherever necessary.*
- 4) *Use of map stencil is allowed.*

Q1) Answer the following questions in two or three sentences. **[10]**

- a) Define Hydrology.
- b) What is hydrologic budget?
- c) What is water vapor?
- d) What is probable maximum precipitation (PMP)?
- e) What percentage of water is stored in rivers?
- f) What is unit of rainfall measurement?
- g) What are the sources of hydrologic data?
- h) Define absolute humidity.
- i) What are hydrological losses?
- j) What is snowfall?

Q2) Write short notes (Any Two): **[10]**

- a) Global water in storage.
- b) Point and areal precipitation.
- c) Interception.

Q3) Answer the following (Any Two): **[10]**

- a) What is Hydrological Cycle?
- b) Gross and net precipitation.
- c) What is palaeohydrology?

Q4) What are important applications of hydrology? **[10]**

OR

What is precipitation? What are various types of precipitation?

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S.Y. B.Sc. (Sem. - I)

MICROBIOLOGY

MB - 211: Microbial Physiology

(Paper - I) (Theory) (2008 Pattern) (51911)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat labelled diagrams wherever necessary.*

Q1) Answer in one or two lines (All questions are compulsory): **[10]**

- a) Define 'Angular Velocity'.
- b) Name any two anabolic pathways.
- c) The "Induced Fit" hypothesis of enzyme binding to substrate was put forth by _____.
- d) Write two examples of cationic exchangers.
- e) Mention the reaction catalysed by 'aldolase' in glycolytic pathway.
- f) Lysozyme acts on _____ substrate & belongs to _____ class of enzyme.
- g) What are the endproducts of the aerobic breakdown of glucose.
- h) Enlist the cofactors required in the preparatory phase of TCA cycle.
- i) Warburg's respirometer can be used for the assay of _____ enzyme.
- j) State true or false:
'Enzymes affect equilibria but not the reaction rate'.

Q2) Attempt any two of the following: **[10]**

- a) Explain the principle of affinity chromatography.
- b) What is pulse chase experiment and its significance.
- c) Schematically describe the pathways for the entry of glycogen, proteins and nucleic acids in the central energy yielding pathway.

P.T.O.

Q3) Attempt any two of the following: **[10]**

- a) What are co - enzymes and prosthetic group? Illustrate it with examples.
- b) Elaborate on phosphoketolase pathway with respect to structure and energy yield.
- c) Justify: DNA and protein estimation can be performed using spectrophotometer.

Q4) Attempt any one of the following: **[10]**

- a) Elaborate on the pentose phosphate pathway with respect to structure and give it's significance.
- b) Explain enzyme classification system according to IUB. Describe the 'Oxidoreductases' and 'Hydrolases' with respect to class, subclass and give 2 reactions of every class.

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S.Y. B.Sc. (Sem. - I)

MICROBIOLOGY

MB - 212: Microbial Genetics

(Theory) (2008 Pattern) (Paper - II) (51921)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat labeled diagrams wherever necessary.*

Q1) Answer the following (All questions are compulsory):

[10]

- a) What is translation?
- b) Draw the structure of Guanine base.
- c) Define frame shift mutations.
- d) Mitochondrial DNA replicates by _____ mechanism.
- e) Enlist & name the termination codons.
- f) HNO_2 converts adenine to _____.
- g) What is dispersive mode of DNA replication.
- h) The _____ form of DNA can exist in polymers having sequence of alternating purines & pyrimidines.
- i) Write the function of DNA Gyrase enzyme.
- j) What is periodic selection?

Q2) Answer any two of the following:

[10]

- a) Describe the salient features of genetic code.
- b) Explain spontaneous mutations with the help of fluctuation test.
- c) Diagrammatically illustrate B form of DNA.

Q3) Attempt any two of the following:

[10]

- a) Explain Avery and Macleod experiment to prove DNA as genetic material.
- b) Elaborate on mutagenic action of non ionizing radiations.
- c) Diagrammatically illustrate plasmid DNA replication.

P.T.O.

Q4) Answer any one of the following:

[10]

- a) Enlist chemical mutagens. Explain in detail mutagenic action of
 - i) Frame shift mutations.
 - ii) Base analogue.

- b) What is central dogma of gene expression? Explain the concept of transcription.

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S.Y. B.Sc.

PSYCHOLOGY

Psychology of Adjustment

(Paper - I) (Sem. - I) (52011) (2008 Pattern)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw the figures and diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer in two or four sentences:

[16]

- a) What is adjustment?
- b) What is psychology?
- c) What is divorce?
- d) What is child abuse?
- e) State the concept of occupational hazards.
- f) State the concept of Dual - earner.
- g) Define abnormal behaviour.
- h) Define anxiety.

Q2) Attempt any two of the following in eight or ten sentences.

[8]

- a) Explain the behaviorist approach of adjustment.
- b) Explain in brief personal characteristics in choosing a career.
- c) Explain the Criteria of abnormal behaviour.

Q3) Write short note on any two of the following:

[8]

- a) Predictors of marital success.
- b) Psychological tests for career decisions.
- c) How love, work and personality are related to happiness?

Q4) Explain the effects of job stress on physical and mental health.

OR

Describe three types of dissociative disorders.

[8]

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S.Y. B.Sc.

PSYCHOLOGY

Experimental Psychology

(2008 Pattern) (Paper - II) (Sem. - I) (52021)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw the figures and diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer in two or four sentences.

[16]

- a) What is colourblindness?
- b) State any two monocular cues of depth perception.
- c) What is reinforcement?
- d) Define thinking.
- e) What is light adaptation?
- f) What is stroboscopic motion?
- g) What is extinction?
- h) What is abstraction?

Q2) Attempt any two of the following in eight or ten sentences.

[8]

- a) Explain the concept of visual acuity.
- b) Explain the binocular determinants of depth perception.
- c) Explain the concepts of generalization and spontaneous recovery.

Q3) Write short notes on any two of the following:

[8]

- a) Trial and error in problem solving.
- b) Primary and secondary reinforcement.
- c) Rod and cone vision.

Q4) Write in detail about instrumental Conditioning.

OR

Write in detail about problem solving process.

[8]

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S.Y. B.Sc.

ELECTRONIC SCIENCE

EL - 211: Analog Circuits and Systems -I

(2008 Pattern) (52211) (Paper - I) (Sem. - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non - programmable calculator is allowed.*

Q1) Attempt all of the following:

- a) What is Radio frequency range. [1]
- b) What is class - AB amplifier. [1]
- c) Define the CMRR. [1]
- d) How to convert an amplifier into an oscillator. [1]
- e) Power amplifiers are used to drive loudspeakers and antenna. Comment. [2]
- f) RC coupled multistage amplifier gain falls at low and higher frequencies
Comment. [2]
- g) An OP - AMP is used in inverting mode with $R_1 = 2k\Omega$, $R_f = 200k\Omega$,
 $V_{in} = 10mV$ and $V_{cc} = \pm 12V$. Find the output voltage. [2]
- h) A power transistor dissipates 5W. If the junction temperature is
 $T_{jmax} = 100^\circ C$ and thermal resistance $\theta = 5^\circ C/W$. Calculate the maximum
ambient temperature at which it can be safely operated. [2]

Q2) Attempt any two of the following:

- a) Classify an amplifier based on frequency range with one application of
each in it. [4]
- b) Explain the concept of feedback. What are positive and negative
feedbacks. [4]
- c) Draw the circuit diagram of differential amplifier using emitter bias. Discuss
differential mode and common mode. [4]

P.T.O.

Q3) Attempt any two of the following:

- a) Draw the circuit diagram of class -A power Amplifier with transformer coupled load. Show that conversion efficiency is 50 %. [4]
- b) Describe OP - AMP as an integrator using neat circuit diagram. [4]
- c) Distinguish between voltage feedback and current feedback. [4]

Q4) Attempt all of the following:

- a) Draw the circuit diagram of 3 stage CE RC coupled amplifier. Explain the need of multistage amplifier. Comment on the overall voltage gain of 3 stage amplifier. [6]
- b) What is an instrumentation amplifier. Draw the neat circuit diagram of instrumentation amplifier using three OP - AMP. Obtain an expression for the gain A_d . [6]

OR

- a) Design the weinbridge oscillator for the operating frequency $f_o = 965$ Hz. When $C = 0.05\mu\text{F}$. [4]
- b) For a transistor BC107 in a CE amplifier circuit $R_1 = 10\text{k}\Omega$, $R_2 = 5\text{k}\Omega$, $R_c = 1\text{k}\Omega$, $R_E = 2\text{k}\Omega$ $V_{cc} = 9\text{v}$. Draw the d.c. load line. [4]
- c) Design an active low pass filter for the cut off frequency $f_c = 1\text{kHz}$ having gain of value 10 for the $C = 0.01\mu\text{F}$. [4]

P149

[3817] - 124

S.Y. B.Sc. (Sem. - I)

ELECTRONIC SCIENCE

EL - 212: Electronic Instrumentation - II

(52221) (Paper - II) (2008 Pattern)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw the neat diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non-programmable calculator is allowed.*

Q1) Attempt all of the following:

- a) Define sensitivity of measuring Instrument. **[1]**
- b) State working principle of LCR meter. **[1]**
- c) What is sweep generator? **[1]**
- d) State any two specifications of UPS. **[1]**
- e) "Resolution decides accuracy of measurement." Comment. **[2]**
- f) "If the waveform on CRO is not steady one has to adjust level control knob." Comment. **[2]**
- g) "Common ground in dual power supply must be properly combined with ground of application circuit." Comment **[2]**
- h) "Speedometer is rpm meter." Comment. **[2]**

Q2) Attempt any two of the following:

- a) With the help of block diagram explain the single trace CRO in brief.**[4]**
- b) State the working principle of DFM and draw the block diagram of it.**[4]**
- c) With the help of block diagram explain working of function generator.**[4]**

Q3) Attempt any two of the following:

- a) Compare dual trace CRO with dual beam CRO. **[4]**
- b) Draw the block diagram of sweep generator and explain it in detail. **[4]**
- c) What is DC to DC converter? State different types of DC to DC converters. **[4]**

P.T.O.

Q4) Attempt all of the following:

- a) Draw the block diagram of digital thermometer and explain it in detail. State the specifications of digital thermometer. **[6]**
- b) Explain with block diagram working of digital pH meter. State specifications of pH meter. **[6]**

OR

Attempt all of the following:

- a) Design multirange D.C. milliammeter for 0 - 50 mA and 0 - 100 mA. If D'Arsonval movement has internal resistance of $100\ \Omega$ and full scale deflection current 1 mA. **[4]**
- b)
 - i) Calculate percentage load regulation for power supply when o/p voltage with no load is 10 volt and o/p voltage with full load is 9.8 volt. **[2]**
 - ii) Calculate percentage line regulation for power supply if o/p voltage of power supply changes by 0.1 volt when i/p voltage changes by 10V. **[2]**
- c) For the CRO, the vertical amplifier control is set at 20mV / div and a display of 4 div signal is obtained. Find peak to peak voltage and RMS voltage of that signal. **[4]**

P159

[3817] - 136

S.Y. B.Sc. (Vocational)

INDUSTRIAL CHEMISTRY

VOC - 211: Utilities & Unit Operations of Process

Instrumentation

(2008 Pattern) (Paper - I) (Sem. - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams wherever necessary.*

Q1) Answer the following: [16]

- a) What is extractive distillation?
- b) Convert 12g cm^{-3} into SI units.
- c) Give the differences between evaporation and distillation.
- d) State Seebeck effect.
- e) Define Hardness of water.
- f) State the principle of Piezoelectric pressure devices.
- g) Write the expression for Reynold number.
- h) What is bound and unbound water?

Q2) Attempt any two of the following: [8]

- a) Describe the applications of steam in industry.
- b) Explain the principle and advantages of an inclined manometer.
- c) Define Crystallization and primary nucleation.

Q3) Write short notes on any two of the following: [8]

- a) Nutrex filters.
- b) Applications of evaporation process in industry.
- c) Ultrasonic pressure devices.

Q4) Explain with a diagram how the Mcleod gauge is used to measure vacuum pressure. [8]

OR

Describe the Lancashire boiler with a diagram.

Total No. of Questions : 5]

[Total No. of Pages : 2

P103

[3817] - 16

F.Y. B.Sc.

GEOGRAPHY - II

**Gg - 120: Geography of Atmosphere and Hydrosphere
(New Course) (Paper - II)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions Carry equal marks*
- 3) *Draw neat diagrams and sketches wherever necessary.*
- 4) *Use of map stencil is allowed.*

Q1) Answer the following questions in two to four sentences

- a) Define the term 'Atmosphere'.
- b) What do you mean by weather?
- c) Define airmasses.
- d) Give source of moisture.
- e) What do you mean by Tsunami?
- f) Define Oceanography.
- g) What do you mean by tides?
- h) What do you mean by frontal zones?

Q2) Explain the following in brief (any four):

- a) Trade Winds.
- b) Global Warming.
- c) Land and sea breezes.
- d) Nature of Oceanography.
- e) Submergence and Emergence of coast.
- f) Causes of tides.

P.T.O.

Q3) Answer the following (Any four)

- a) Types of airmasses.
- b) Explain concept of rain and fog.
- c) SW Monsoon Winds.
- d) Ria Coast.
- e) Salinity of Mediterranean sea.
- f) Effects of Ocean currents.

Q4) Answer the following (Any Two)

- a) Explain structure of the atmosphere.
- b) Explain vertical and horizontal distribution of pressure.
- c) Explain Equilibrium theory of tides.
- d) Formation of Ocean currents of Indian Ocean.

Q5) Explain factors affecting horizontal distribution of temperature.

OR

Explain with a neat diagram Oceanic relief.

Total No. of Questions : 5]

[Total No. of Pages : 4

P90

[3817]-1

F.Y. B.Sc.

MATHEMATICS

Algebra and Geometry

(Paper - I) (2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates :

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Attempt each of the following :

[16]

- a) Find $B \times A$ for the sets
 $A = \{1, 2, 3, 4\}$ and $B = \{1, 5, 6\}$.
- b) Let the functions $f : R \rightarrow R$ and $g : R \rightarrow R$ be defined by $f(x) = 2x + 1$ and $g(x) = x^3$. Find the formula for $f \circ g$.
- c) Which elements of Z_8 satisfy $x^2 = x$?
- d) Find the values of a and b if 1 and -2 are the roots of the equation $x^4 + 2x^2 + ax + b = 0$.
- e) Find the transformed form of the equation $2x^2 + 3xy - 4y^2 + x + 3 = 0$ when origin is shifted to the point $(1, -2)$.
- f) Find the direction cosines of the line passing through the points $(2, 3, -1)$ and $(0, -1, 2)$.
- g) Find the values of λ , if two planes given by $x - 3y + 3z = 4$ and $3x + 2y - \lambda z = 6$ are perpendicular to each other.
- h) Find the equation of the sphere on AB as diameter, where $A(2, -3, 1)$ and $B(-1, -2, 4)$.

P.T.O.

Q2) Attempt any four of the following : **[16]**

- a) If \sim is an equivalence relation in a set S and $a, b \in S$. Then prove that $b \in [a]$ iff $[a] = [b]$.
- b) If z_1 and z_2 are two complex numbers such that $|z_1 - z_2| = |z_1 + z_2|$, then prove that $\frac{iz_1}{z_2}$ is a purely real number.
- c) Let a function $f: R \rightarrow R$ be defined by $f(x) = \frac{3x-5}{2}$. Is f invertible? If so obtain formula for f^{-1} .
- d) By using Euclidean algorithm, find greatest common divisor (g.c.d.) d of integers 4446 and 368. Also find integers m and n such that $d = 4446m + 368n$.
- e) If a polynomial $f(x) = x^3 - 5x^2 + kx + 8$ is divided by $x + 2$, then remainder is -24 . Find value of k .
- f) Find modulus and argument of the complex number $z = \frac{3+i}{3-i}$.

Q3) Attempt any two of the following: **[16]**

- a) Prove that for any two non-zero integers a and b have unique positive greatest common divisor $d = (a, b)$ and can be expressed in the form $d = ma + nb$, for some integers m and n .
- b) If z_1 and z_2 are complex numbers, then prove that $|z_1 + z_2| \leq |z_1| + |z_2|$.
Hence prove that $|z_1 - z_2| \geq \left| |z_1| - |z_2| \right|$.
- c) i) Find the remainder, when 5^{40} is divided by 7.
ii) By using DeMoivre's theorem, express $\cos 5\theta$ and $\sin 5\theta$ in terms of powers of $\cos \theta$ and $\sin \theta$ respectively.
- d) Prepare addition and multiplication table for z_6 .

Q4) Attempt any four of the following: [16]

- a) Discuss the nature of the conic $7x^2 + 8xy + y^2 + 6x + 6y - 9 = 0$ and find its centre.
- b) Find the angle between two lines whose direction cosines are l_1, m_1, n_1 and l_2, m_2, n_2 .
- c) Find the equation of the plane containing the line of intersection of the planes $5x - z + 1 = 0$; $2x + y + 2 = 0$ and containing the point $(3, 4, 3)$.
- d) Show that the two lines $\frac{x-1}{-1} = \frac{y-8}{7} = \frac{z-2}{2}$ and $\frac{x+1}{1} = \frac{y-2}{-1} = \frac{z+4}{1}$ are coplanar.
- e) Find the condition under which the plane $lx + my + nz = p$ is a tangent plane to the sphere $x^2 + y^2 + z^2 = a^2$.

- f) Find rank of matrix $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 \end{bmatrix}$ by reducing it to row echelon form.

Q5) Attempt any two of the following: [16]

- a) Define rotation of axes and obtain equations for rotation of axes.
- b) i) The plane $x + 2y - 2z + 3 = 0$ bisects the angle between two planes. One of which is $2x + 2y + z + 1 = 0$. Find the equation of the other plane.
- ii) Find the distance of the point $p(1, 2, -3)$ from the plane $2x + y - 6z + 2 = 0$ measured parallel to the line $2x = -y = 3z$.
- c) i) Explain Gauss elimination method for solving a system of three linear equations
- $$a_{11}x_1 + a_{12}x_2 + a_{13}x_3 = b_1$$
- $$a_{21}x_1 + a_{22}x_2 + a_{23}x_3 = b_2$$
- $$a_{31}x_1 + a_{32}x_2 + a_{33}x_3 = b_3.$$
- ii) Find the centre and radius of the circle $x^2 + y^2 + z^2 - 4x + 6z - 3 = 0$; $x + 2y - 2z = 17$.

d) i) Find for what values of λ , the system of equations

$$x + y + z = 6$$

$$x + 2y + 3z = 10$$

$$x + 2y + \lambda z = -4.$$

has a unique solution.

ii) Show that the plane $2x - 2y + z + 16 = 0$ touches the sphere $x^2 + y^2 + z^2 + 2x - 4y + 2z - 3 = 0$.



Total No. of Questions : 4]

[Total No. of Pages : 2

P127

[3817] - 102

S.Y. B.Sc.

MATHEMATICS

MT - 212 (A) and MT - 212 (B)

(Paper - II (A)) (Sem. - I) (2008 Pattern) (51121)

MT - 212 (A) : Differential Equations

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates :

- 1) Candidates are advised to see the relevant question paper and solve the same.
- 2) All questions are compulsory.
- 3) Figures to the right indicate full marks.
- 4) D stands for the differential operator.

Q1) Answer the following questions :

[10]

- a) Solve : $xydx - 2dy = 0$
- b) Find order of the differential equation

$$\left(\frac{d^3y}{dx^3}\right)^2 - 2\left(\frac{d^2y}{dx^2}\right)^4 + y = 0$$

- c) Solve : $(D^2 - 4D + 4)y = 0$
- d) Find $\frac{1}{D^2}(e^{3x} + \cos x)$
- e) Define Bernoulli's equation.
- f) Solve : $(D - 1)y = 3$ if $y(0) = 0$
- g) Find a differential equations whose solutions are e^x, e^{-x}, e^{2x} .
- h) Find integrating factor of the differential equation
 $y(x + y)dx + (x + 2y - 1)dy = 0$
- i) Verify that $y = \frac{-x \cos x}{2}$ is a solution of $(D^2 + 1)y = \sin x$.
- j) Find three solutions of $(D^2 - 1)y = 0$.

Q2) Attempt any two of the following :

[10]

- a) With usual notation, prove that $f(D - a)[e^{ax}y] = e^{ax}f(D)y$
- b) Use the method of reduction of order to solve $(D^2 - 5D + 6)y = 2e^x$.
- c) Find the orthogonal trajectory of the family of circles passing through origin with centres on the X-axis.

P.T.O.

Q3) Attempt any two of the following : **[10]**

a) Prove that $\frac{1}{D^2 + a^2}(\cos ax) = \frac{x}{2a} \sin ax$

b) Use method of variation of parameters to solve $(D^2 - 1)y = e^x + 1$.

c) Solve : $(D^4 - 2D^3 + 5D^2 - 8D + 4)y = 0$

Q4) a) Explain the method of undetermined coefficients to solve the non-homogeneous differential equation. **[6]**

b) Solve $(x - 2y)dx + 2(y - x)dy = 0$. **[4]**

OR

a) Explain the method of solving homogeneous differential equation of first order and first degree. **[6]**

b) Solve : $(y - \cos^2 x)dx + \cos x dy = 0$ **[4]**



Total No. of Questions : 4]

[Total No. of Pages : 2

P127

[3817] - 102

S.Y. B.Sc.

MATHEMATICS

MT - 212 (A) and MT - 212 (B)

(Paper - II (B)) (Sem. - I) (2008 Pattern) (51121)

MT - 212 (B) : Numerical Analysis

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates :

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of non programmable calculator is permitted.

Q1) Attempt the following questions : [10]

- a) An approximate value of e is given by 2.7195518 and its true value is 2.71821828. Find the relative error.
- b) Round-off the following numbers to four significant figures : 28.155201, 0.0033418.
- c) Show that the equation $x^9 - x^5 + x^4 + x^2 + 1 = 0$ has at least six imaginary roots.
- d) Is it possible to solve the system of equations $4x - 8y = 11$; $3x + 5y = 2$ by Gauss-Seidel iterative method? Justify.
- e) If $f(x) = \frac{1}{x+1}$; ($x \neq -1$). Find the first divided difference $f(3, 5)$.
- f) Evaluate $\Delta \tan^{-1} x$.
- g) Evaluate $\Delta^{10} [(1 - 3x^5)(1 + x^4)(1 - 7x)]$.
- h) State Lagrange's interpolation formula for unequal intervals.
- i) Show that $\Delta^3 f(x) = f(x + 3h) - 3f(x + 2h) + 3f(x + h) - f(x)$.
- j) Is it possible to evaluate the integral $\int_{-3}^3 x^4 dx$ by using Simpson's $\frac{3}{8}$ rule when interval is divided into 10 subintervals of equal width? Justify.

P.T.O.

Q2) Attempt any two of the following : **[10]**

- a) Solve the following system of equations by Gauss-Seidel iterative method (Take two iterations)

$$10x + 2y + z = 9$$

$$x + 10y - z = -22$$

$$-2x + 3y + 10z = 22$$

- b) Determine a second degree polynomial to fit the following data :

x :	-2	-1	0	1	2
y :	-1.2	-1.5	-1.3	1.9	7.1

- c) Solve the equation $x^3 - 9x + 1 = 0$ for the root lying between 2 and 4 by Regula - Falsi method. (Take 2 iterations)

Q3) Attempt any two of the following : **[10]**

- a) Derive Newton's divided difference interpolation formula.
 b) Find the number of students who obtained less than 45 marks, from the following data :

Marks :	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
No. of students :	31	42	51	35	31

- c) Estimate the missing term in the following data :

x :	0	1	2	3	4	
y :	1	3	9	-	8	1

Q4) Attempt any one of the following : **[10]**

- a) Derive Simpson's $\frac{1}{3}$ rd rule for integration and hence find $\int_0^{80} y dx$ from the following data :

x :	0	10	20	30	40	50	60	70	80
y :	0	4	7	9	12	15	14	8	3

- b) Use the second order Runge - Kutta formula to approximate y when $x = 0.1$ and $x = 0.2$. Given that $x = 0$ when $y = 1$ and $\frac{dy}{dx} = x + y$.



Total No. of Questions : 4]

[Total No. of Pages : 2

P129

[3817] - 104

S.Y. B.Sc. (Sem. - I)

PHYSICS

PH - 212 : Electronics

(Paper - II) (2008 Pattern) (51221)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculators and log-tables are allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Symbols have their usual meanings.*

Q1) Attempt all of the following :

- a) Define capacitor. What is unit of capacitance? [1]
- b) What is turns ratio of transformer? Give its significance. [1]
- c) State Superposition principle. [1]
- d) A transistor has a current gain of 200. If the base current is 0.1 mA. What is the collector current? [1]
- e) Calculate the gain of an inverting amplifier. The value of input resistance is $10\text{ K}\Omega$ and that of feedback resistor is $100\text{ K}\Omega$. [1]
- f) Define ripple factor. [1]
- g) What is the advantage of transistor series voltage regulator? [1]
- h) Define percentage load regulation. [1]
- i) What are the advantages of full-wave rectifier over half-wave rectifier? [1]
- j) Convert $(539)_{10}$ to hexadecimal system. [1]

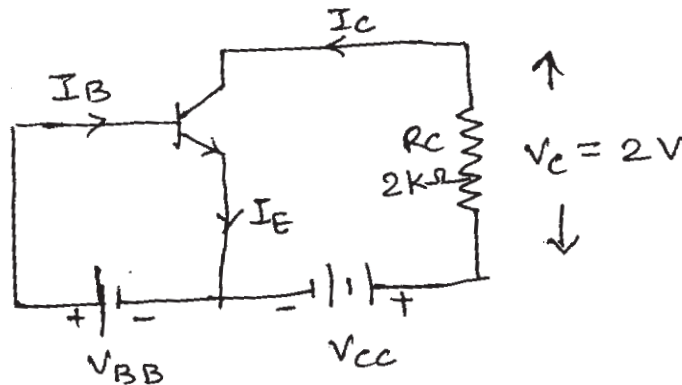
Q2) Attempt any two of the following :

- a) State Thevenin's theorem. How to thevinize a circuit. [5]
- b) Explain the construction and working of UJT. [5]
- c) Explain with circuit diagram Op-amp as an adder. [5]

P.T.O.

Q3) Attempt any two of the following :

- a) For a transistor shown in figure, the voltage drop across $2\text{ K}\Omega$ collector resistance is 2 V . If $\beta = 50$, find the base current. [5]



- b) In a negative feedback amplifier, $A = 50$, $\beta = 0.02$ and $V_i = 50\text{ mV}$. Find
- gain with feedback
 - output voltage
 - feedback factor
 - feedback voltage. [5]
- c) Reduce the following Boolean expression and draw the logic diagram as well $AB + A(B + C) + B(B + C)$ [5]

Q4) a) Attempt (i) or (ii) of the following :

- Describe voltage divider bias method. [4]
 - Explain gain of amplifier with feedback. [4]
 - Explain working of transistor series voltage regulator with a neat diagram. [4]
 - Draw symbols of AND and OR gate. Give their truth tables. [4]
- b) Attempt any one of the following :
- What is transformer? List different losses of transformer. [2]
 - State maximum power transfer theorem. Give its significance. [2]



Total No. of Questions : 4]

[Total No. of Pages : 2

P129

[3817] - 104

S.Y. B.Sc. (Sem. - I)

PHYSICS

PH - 212 : Instrumentation

(Paper - II) (2008 Pattern) (51221)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculators and log tables are allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) Attempt all of the following :

- a) Explain the term Hysteresis. [1]
- b) What is load cell? [1]
- c) Give SI unit of pressure. [1]
- d) What is MRI? [1]
- e) What is diamagnetic substance? Give two examples. [1]
- f) If the pressure of sound at one meter from a motor cycle was found to be 20 N/m^2 , determine the corresponding sound pressure level in decibel if P_{ref} is 0.0002 N/m^2 . [1]
- g) State Bernoulli's theorem. [1]
- h) The dead zone in certain thermometer is 0.125 percent of span. The calibration is 400°C to 1200°C . What temperature change might occur before it is detected? [1]
- i) What do you mean by primary standards of measurement? [1]
- j) What do you mean by active transducer? [1]

Q2) Attempt any two of the following :

- a) Explain basic functional elements of a typical measurement system with block diagram. [5]
- b) What do you mean by cantilever beam? Explain how it is used for the measurement of force. [5]
- c) Explain the working of LVDT with neat diagram. [5]

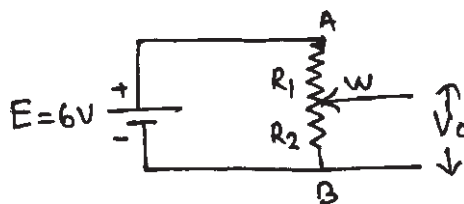
P.T.O.

Q3) Attempt any two of the following :

- a) A pitot tube is fixed in a water pipe line of diameter 20 cm, a difference of pressure indicated by the gauge is 5 cm of water column, calculate the rate of flow of water through the pipe. [5]
- b) The magnetising field (\bar{H}) of 1600 Am^{-1} produces a magnetic flux (ϕ) 2.4×10^{-5} weber in a bar of iron of cross section 0.2 cm^2 . Calculate the relative permeability (μ_r) and intensity of magnetisation (\bar{B}). (Given $\mu_0 = 4\pi \times 10^{-7} \text{ TA}^{-1}\text{m}$). [5]
- c) Calculate the heart rate if the chart speed of ECG machine is 50 mm/sec and distance between successive R–R interval is 30 mm . [5]

Q4) a) Attempt (i) or (ii) of the following :

- i)
 - 1) Define sensitivity of a measuring instrument. Determine the sensitivity when input voltage of an instrument changes from 10V to 12V and the corresponding output voltage changes from 50V to 60V . [4]
 - 2) Write a short note on C-type Bourdon tube. [4]
 - ii)
 - 1) Describe the use of pyranometer for measurement of solar radiation. [4]
 - 2) State and explain the different types of errors in measurement. [4]
- b) Attempt any one of the following :
- i) What is Hall effect? [2]
 - ii) A resistive transducer for displacement measurement with a shaft of 4.5 in is applied to the following circuit. The total resistance of potentiometer is $6 \text{ K}\Omega$. When the wiper is 0.9 in from point B, what is the value of output voltage. The applied voltage is 6V . [2]



Total No. of Questions : 4]

[Total No. of Pages : 2

P130

[3817] - 105

S.Y. B.Sc. (Sem. - I)

CHEMISTRY

CH - 211 : Physical Chemistry

(51311) (2008 Pattern) (Theory)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic table and calculator is allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) Answer the following :

[10]

- a) What are the limitations of the third law of thermodynamics?
- b) What is Nernst Distribution law?
- c) Write the relation between K_p and K_c .
- d) Explain the term abnormal molecular weight.
- e) State Henry's law.
- f) Define vapour pressure of a liquid.
- g) What is Van't Hoff's factor?
- h) Define ideal and non-ideal solutions.
- i) Give any two physical significance of free energy change.
- j) Define isotonic solutions.

Q2) a) Attempt any two of the following :

[6]

- i) Discuss the methods of assignment of absolute entropies.
- ii) State and explain the applications of clapeyron equation.
- iii) Define : molarity, normality and molality.

b) Solve any one of the following :

[4]

- i) The boiling point of a solution containing 2.56 gm of substance A per 100 gm water is higher by 0.052°C than the boiling of pure water. Calculate the molecular weight of the substance, if K_b for water is 0.512.
- ii) Calculate amount of solute extracted from 100 ml of aqueous solution containing 5 gm of solute on extracting with 40 ml ether every time in 4 lots. The partition coefficient of solute in water to ether is 4.

P.T.O.

- Q3) a)** Attempt any two of the following : [6]
- Define the term solution and give different types of binary solutions with example.
 - Give the thermodynamic proof of Nernst Distribution Law.
 - Explain the Arrhenius theory of electrolytic dissociation.
- b)** Solve any one of the following : [4]
- 4 gm of Helium gas expand reversibly and isothermally at 30°C from a pressure of 1 atm to 0.1 atm. What is the change in Gibbs free energy
[R = 8.314 JK⁻¹ mole⁻¹, Atomic weight of He = 2]
 - 100 gm mixture of organic liquids A and B contains 40 gm of B. The vapour pressure of pure A is 2.7 x 10⁴ Nm⁻² and that of pure B is 3.7 x 10³ Nm⁻² at 25°C. Assuming that they form ideal solution. Calculate the total pressure and partial pressure of each constituent above the solution at 25°C.
(Mole. weight of A = 78 and B = 92).

- Q4) a)** Attempt any one of the following : [6]
- Derive Gibbs Helmholtz equation and give its applications.
 - Describe with the help of neat diagram Landberger's method for determining the molecular weight of a given solute.
- b)** Attempt any one of the following : [4]
- Explain the principle and experimental setup of steam distillation.
 - Explain isoteniscope method to determine vapour pressure of liquid.



Total No. of Questions : 4]

[Total No. of Pages : 3

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[3817] - 122

S.Y. B.Sc.

STATISTICAL TECHNIQUES

STT - 212 : Statistical Techniques - II

(Sem. - I) (2008 Pattern)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates :

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of statistical tables is allowed.
- 4) Use of scientific calculator is allowed.
- 5) Symbols and abbreviations have their usual meaning.

Q1) Attempt each of the following :

- a) Choose the correct alternative in each of the following cases : [1 Each]
 - i) The number of samples of size 2 that can be drawn by SRSWR from a population containing 10 observations is
 - A) 2^{10}
 - B) 100
 - C) 20
 - D) 45
 - ii) For a single sampling plan with $N = 100$, $n = 20$, if $ATI = 40$ then the probability of rejecting the lot is
 - A) 0.25
 - B) 0.75
 - C) 0.1
 - D) 1
 - iii) In double sampling plan, $\{N, n_1, n_2, c_1, c_2\}$ with d_1, d_2 denote respectively the number of defectives in the first and second samples drawn, the decision of rejecting the lot is taken on the basis of first sample when
 - A) $d_2 > c_2$
 - B) $d_1 > c_1$ and $d_2 < c_2$
 - C) $d_1 + d_2 > c_2$
 - D) $d_1 > c_2$
- b) In each of the following cases, state whether the given statement is true or false : [1 Each]
 - i) AOQ gives average outgoing quality of lot sent to the market.
 - ii) The estimator of population mean under Stratified random sampling is an unbiased estimator.
 - iii) The nature of operating characteristic curve for a single sampling plan is decreasing.

P.T.O.

- c) In a stratified random sampling with 2 strata the values of N_i and S_i are as follows : [1]

Stratum Number	N_i	S_i
1	6000	2
2	4000	4

If total sample size is 1600, compute the sample sizes under optimum allocation.

- d) State one real life situation where sampling for proportions is used. [1]
 e) For a single sampling plan $\{N = 1000, n = 100, c = 1\}$ find the probability of accepting the lot of quality 0.03. [1]
 f) State the formula of ATI for double sampling plan. [1]

Q2) Attempt any two of the following : [5 Each]

- a) Define simple random sampling with replacement (SRSWR) and simple random sampling without replacement (SRSWOR) from a finite population. State the unbiased estimators of the population mean and its variance based on the above two methods.
 b) From a lot consisting of 1200 items, a sample of size 150 is taken. If it contains 3 or less defectives, the lot is accepted, otherwise it is rejected. Compute the average total amount that is inspected (A.T.I.) under the above sampling plan. Assume that the submitted lot is of quality $p = 0.04$.
 c) What is stratified random sampling? Give any one real life situation where stratified random sampling is an appropriate method of sampling. State the expression of an estimator of population mean and its standard error under stratified random sampling.

Q3) Attempt any two of the following : [5 Each]

- a) A sample of 30 students is to be drawn from a population consisting of 300 students belonging to two colleges A and B. The total number of students in each college, the mean and standard deviation of marks in both the colleges are given below :

Stratum	Total number of students (N_i)	Mean (\bar{Y}_{ni})	S.D. (S_i)
College A	200	30	10
College B	100	60	40

What should be the stratum sample sizes under proportional allocation? Obtain the estimate of population mean and the estimate of its variance under proportional allocation?

- b) A random sample of 100 pineapples is selected from a consignment containing 2000 pineapples and 65 are found to be bad. Estimate the total number of bad pineapples in the consignment. Also estimate the standard error of the estimate.
- c) Explain the construction of OC curve in case of double sampling plan. Mention the uses of OC curve.

Q4) Attempt any one of the following :

- a) i) Calculate AOQ for a double sampling plan :
 $\{N = 2000, n_1 = 100, n_2 = 50, c_1 = 1, c_2 = 3\}$.
 Given that the lot quality is 0.03. [6]
- ii) Show that in simple random sampling without replacement the probability that a specified unit of the population being selected at any given draw is equal to the probability that it is being selected at any given draw. [4]
- b) i) Draw all possible samples of size 2 by the method of SRSWOR from the population consisting of four observations 2, 3, 5, 6. Further calculate the sample mean \bar{x} for all the samples drawn and verify that the sample mean is unbiased estimator of population mean i.e.
 $E(\bar{x}) = \bar{X}$. [5]
- ii) Explain the terms : AQL, LTFD, Producers risk, Consumers risk. [5]



P984

[3817]-131A

S.Y. B.Sc. (Sem. - I)

मराठी (Marathi)

{dntdy (anr nrqrwH\$)

(ZdnAä`ngHk\$) (2010 Pattern) (Theory)

द... 2 Vg]

[EH\$JWU... 40

- gMm... 1) g0 äiz g0S{dU Anl H\$ AthV. \$
- 2) C0H\$>bA\$F\$ äizngMb JW X0{dM.

äiz 1) InbniH\$ H\$noE`nr H\$ {d`n0a 400 ä`ng`v {Z-SY {dm. [10]

- A) ObäXyFU
- ~) `vH\$AnUH\$S\$mgSH\$R
- H\$ 0E`j0r An`m g0`ao ... (b{bV)

äiz 2) H\$0XZ `mH\$WYZb{H\$Z0 H\$0Vndj{m{Z\$N{i>H\$0Z `mS\$0nAn0? [15]

H\$H\$

gwf{JMSR ASY0n `mboM`YZ ä`0> P00`m {MnansMnran00 0`m.

äiz 3) {Qm {dm. (H\$noE`nr VZ) [15]

- A) b0b0Vr `mJ<SVMR {Z{0Vr H\$er P0r ?
- ~) M\$S\$FZmAnv0Xm0H\$m ä`Q00V0 ?
- H\$ H\$0n{Z0H\$g `nsÀ`m i`v`I0M0b d;km{Z\$H\$SÀ`m mD\$0WUm ~nb0UM H\$em {XgM`V ?
- S) An0Q0n0ZÀ`mJ0E`H\$0nÀ`m {0`ngV0 {d0Z 0WVH\$0U0R H\$S\$V0R H\$0r ?
- B) `n0g| An0r {0bH\$w0`h0dZ`gM`V, Ag0 {Z`0W\$na \SSH\$00 `nsZmH\$nd0V0 ?
- V) S0P. `n0d `ns0 i`0M0 a0n0m.



P984

[3817]-131A

S.Y. B.Sc. (Sem. - I)

भाषा (Marathi)

{dknZ H\$Wm {obe (QwZm Aä`ng H\$K\$)

di... 2 Vg]

[EH\$UWU... 40

- gMm... 1) g@ äiZ gnoS {dÜ Anoi H\$ Anhv. \$
- 2) C@H\$S>b AS\$ äiZm Mb JW X@{dMv.

äiZ 1) nW>miH\$ H\$UÈnr Èñ {df`nca 400 èxgn`v {Z-SY {dm. [10]

A) gd@MwîH\$oz - {d\$gMm_m@

~) hA\$S\$Z Zä ...

H\$ H\${dÜ`m Jndn H\$m Onb ? (c{dV)

äiZ 2) ""{dknZ H\$Wm\$ YyZ `nzr gnO An{U `nzr `znc {dknZ`À`m n{dUm`n\$Mb {MÜ Agvò'' `m {dM`ZMm ""{dknZ H\$Wm {díd' `Yrb H\$Wm\$À`m An{nc@ An{L`ndn è`m. [15]

qñh

'AS`m`Vb `E`y' `mH\$WVb SnP. {d\$g no`o n\$À`m `E`y`Mb Jy> C\$yZ Xñh.

äiZ 3) {Qm {dm. (H\$UÈnr VZ) [15]

A) "An\$he An{U O`rZ' `Yrb "n{h@Mr `ndzn`mZm.

~) "Uwlr' H\$WVb "gn{H\$'.

H\$ "V@Uam`gnH\$' `m`n@M`r gn@M.

S) SnP. An@. An@Z`ra.

B) "SÌ `nzch`À`m h`mVzo' `Yrb `nzr rñ`nd XecZ.

V) ""{dknZ H\$Wm {díd'Vb H\$Wm\$ YyZ Èndr {dknZ{df`H\$ OnW`r.



[3817] – 141

S.Y.B.Sc. (Semester – I) (Vocational) Examination, 2010
SEED TECHNOLOGY
Hybrid Seed Production
(Paper – III) (New Course)

Time : 2 Hours

Max. Marks : 40

- Instructions :** 1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw neat labelled diagrams wherever necessary.*

1. Attempt the following : **(10×1=10)**
- a) What is inbreeding depression ?
 - b) Give any one significance of apomixis.
 - c) Enlist different types of male sterility.
 - d) Define self incompatibility.
 - e) What is emasculation ?
 - f) What are pollen shedders ?
 - g) Define planting ratio.
 - h) What is pollen viability ?
 - i) Give the requirement of isolation distance in Bajara.
 - j) Enlist different sowing methods.
2. Attempt **any two** of the following : **(2×5=10)**
- a) Comment on genetic basis of heterosis.
 - b) What is cytoplasmic male sterility ? Add a note on their use in hybrid seed production.
 - c) Explain the use of gametocides in hybrid seed production.

P.T.O.



3. Write short notes on **any two** of the following : **(2×5=10)**

a) Roguing.

b) Planting ratio.

c) Stigma receptivity.

4. Describe procedure for hybrid seed production in Jowar with respect to source of seed, land requirements, isolation, sowing, cultural practices, roguing, harvesting and threshing. **10**

OR

4. Give stepwise procedure for hybrid seed production in Groundnut. **10**

Total No. of Questions : 5]

[Total No. of Pages : 4

P91

[3817] - 2

F.Y. B.Sc.

MATHEMATICS

Calculus

(Paper - II) (2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates :

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Attempt each of the following :

[16]

- a) Solve, $|4x+5| \leq 19$.
- b) Show that $\sum_{n=1}^{\infty} \frac{n-1}{n+2}$ is divergent.
- c) Define a contractive sequence.
- d) Find the left hand limit of $\lim_{x \rightarrow 0} \left(\frac{3x+|x|}{7x-5|x|} \right)$.
- e) Discuss the continuity of the function $f(x)$ at $x = 2$, where
$$f(x) = \frac{|x-2|}{(x-2)}, \text{ if } x \neq 2$$
$$= 0, \text{ if } x = 2.$$
- f) Evaluate $\lim_{x \rightarrow 0} \frac{\log(\sin x)}{\cot x}$.
- g) If $x = \tan(\log y)$, then prove that, $(1 + x^2)y_1 - y = 0$.
- h) State Maclaurin's theorem with Lagrange's form of remainder.

P.T.O.

Q2) Attempt any four of the following : **[16]**

- a) Prove that for any real number y , $\exists n \in \mathbb{N}$ such that $nx > y$, where x is any positive real number.
- b) Show that the sequence $\langle X_n \rangle$ of real numbers, whose n^{th} term is defined by $X_n = \frac{1}{n+1} + \frac{1}{n+2} + \frac{1}{n+3} + \dots + \frac{1}{n+n}$, $\forall n \in \mathbb{N}$ is convergent.
- c) Prove that $\lim_{x \rightarrow 0} (x \cdot \sin x) = 0$.
- d) Examine the convergence of the series $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n^2+2}}$.
- e) Prove that every convergent sequence in the set of real number \mathbb{R} is bounded.
- f) If $x_n = \sqrt{n}$, then find $\lim_{n \rightarrow \infty} [X_{n+1} - X_n]$. Where x_n is n^{th} term of the sequence $\langle X_n \rangle$.

Q3) Attempt any two of the following: **[16]**

- a) Prove that $\sum_{n=1}^{\infty} \frac{1}{n^p}$ is divergent; if $p \leq 1$.
- b) i) Prove that the sequence $\langle a_n \rangle$ defined by $a_1 = \sqrt{5}$, $a_{n+1} = \sqrt{5a_n}$ for all $n \in \mathbb{N}$ is convergent.
- ii) Determine the set $A = \{x \in \mathbb{R} / x^2 > 3x + 4\}$.
- c) i) If the limit of a function f as $x \rightarrow c$ exists, then prove that function f is bounded in a deleted neighbourhood of c .
- ii) If $a_1 = 1$ and $a_{n+1} = 1 + \frac{1}{a_n}$ for $n \in \mathbb{N}$, then show that sequence $\langle a_n \rangle$ is contractive sequence.

d) i) State the order axioms for set of real numbers.

ii) Evaluate $\lim_{x \rightarrow 0} \frac{e^{1/x} - 1}{e^{1/x} + 1}$, if exists.

Q4) Attempt **any four** of the following:

[16]

a) State and prove Cauchy's Mean value theorem.

b) Discuss the continuity of the function $f(x) = \frac{x - |x|}{x}$, if $x \neq 0$
 $= 2$, if $x = 0$
at $x = 0$.

c) Verify Rolle's theorem for the function $f(x) = \log \left[\frac{x^2 + ab}{(a+b)x} \right]$ on $[a, b]$.

d) Evaluate $\lim_{x \rightarrow \frac{\pi}{2}} (\sec x)^{\cot x}$.

e) Verify Lagrange's Mean value theorem for the function $f(x) = 3x^2 - 5x + 1$ on $[2, 5]$.

f) Obtain the expansion of $e^{\sin x}$ up to the first four terms.

Q5) Attempt **any two** of the following:

[16]

a) i) If $y = e^{ax} \cdot \sin(bx + c)$, then prove that $y_n = r^n \cdot e^{ax} \cdot \sin(bx + c + n\theta)$.

Where $r = \sqrt{a^2 + b^2}$ and $\theta = \tan^{-1} \frac{b}{a}$.

ii) If $y = \frac{x+1}{x^2-4}$ then find y_n .

b) If $f: [a, b] \rightarrow \mathbb{R}$ is continuous function on $[a, b]$ and $f(a) \cdot f(b) < 0$ then prove that there exists a number $c \in (a, b)$ such that $f(c) = 0$.

- c) i) Evaluate $\lim_{x \rightarrow 0} \left(\frac{1}{x} - \frac{1}{\sin x} \right)$.
- ii) Discuss the continuity of the function $f(x)$ at $x = 3$, where.

$$f(x) = \frac{x^2}{3} - 3, \text{ if } 0 < x < 3$$

$$= 0, \text{ if } x = 3$$

$$= 3 - \frac{27}{x^2}, \text{ if } x > 3.$$

- d) i) If $y = a \cos(\log x) + b \sin(\log x)$, then show that
- $$x^2 y_{n+2} + (2n+1)x \cdot y_{n+1} + (n^2+1)y_n = 0.$$
- ii) Find α and β , if the function $f(x)$ is continuous in $(-2, 2)$, where

$$f(x) = x - \alpha, \quad -2 < x < 0$$

$$= 3x + 5, \quad 0 \leq x < 1$$

$$= \beta - x, \quad 1 \leq x < 2.$$



Total No. of Questions : 4]

[Total No. of Pages : 2

P115

[3817]-28

F.Y. B.Sc.

FOUNDATION COURSE

(Restructuring)

Time : 3 Hours]

[Max. Marks : 80

Instructions :

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Explain the following concepts in 50 words each. (Any two) **[10]**

- a) Religion.
- b) Nation.
- c) Hypothesis.
- d) Globalization.

Q2) Write the following short notes in 100 words. (Any four) **[20]**

- a) National Integration.
- b) Culture.
- c) Population Explosion.
- d) Equality.
- e) Global warming.
- f) Reservation.

Q3) Write answers of the following questions in 200 to 250 words each. (Any three) **[30]**

- a) Explain the role of Basic Human values in Education.
- b) Explain the causes of Unemployment in India.
- c) Explain effects of superstitions.
- d) State the demerits of cast system in India.
- e) State the merits of Indian Democracy.

P.T.O.

Q4) Write the answer of any one of the following in 500 words. **[20]**

- a) State the importance of Agriculture and Industries in Indian Economy.
- b) Define science and state the characteristics of science.



Total No. of Questions : 4]

[Total No. of Pages : 2

P115

[3817]-28

F.Y. B.Sc.

पायाभुत अभ्यासक्रम

(Restructuring)

मराठी रूपांतर

वेळ : 3 तास]

[एकूण गुण : 80

- सूचना :- 1) सर्व प्रश्न सोडविणे आवश्यक आहेत.
2) उजवीकडील अंक पूर्ण गुण दर्शवितात.
3) संदर्भासाठी मूळ इंग्रजी प्रश्नपत्रिका पहावी.

-
- प्रश्न 1) पुढील संकल्पना 50 शब्दांत स्पष्ट करा. (फक्त दोन) [10]
- a) धर्म.
b) राष्ट्र.
c) गृहितक.
d) जागतिकीकरण.
- प्रश्न 2) पुढील टिपा प्रत्येकी 100 शब्दांत लिहा. (फक्त चार) [20]
- a) राष्ट्रीय एकात्मता.
b) संस्कृती.
c) लोकसंख्या विस्फोट.
d) समता.
e) जागतिक तापमान वाढ.
f) आरक्षण.
- प्रश्न 3) पुढील प्रश्नांची उत्तरे प्रत्येकी 200 ते 250 शब्दांत लिहा. (फक्त तीन) [30]
- a) मुलभूत मानवी मुल्यांची शिक्षणातील भूमिका स्पष्ट करा.
b) भारतातील बेकारीची कारणे स्पष्ट करा.
c) अंधश्रद्धेचे परिणाम स्पष्ट करा.
d) भारतातील जाती प्रथेचे दोष सांगा.
e) भारतीय लोकशाहीचे गुण सांगा.

P.T.O.

प्रश्न 4) पुढीलपैकी एका प्रश्नाचे उत्तर 500 शब्दांत लिहा.

[20]

- a) भारतीय अर्थव्यवस्थेतील शेती आणि उद्योगांचे महत्व सांगा.
- b) विज्ञानाची व्याख्या द्या आणि विज्ञानाचे वैशिष्ट्ये सांगा.



Total No. of Questions : 5]

[Total No. of Pages : 3

P92

[3817]-3

F.Y. B.Sc.

PHYSICS

Mechanics, Heat and Thermodynamics

(11210) (Paper - I) (New Course)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of log table and calculator is allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) Attempt all of the following :

- a) State and explain Newton's third law of motion. [2]
- b) What do you mean by workdone? Give its SI unit. [2]
- c) Give SI unit and dimensions of Surface Tension. [2]
- d) The position of a particle along x-axis is given by $x = 3 - 4t + 8t^2$. Find the acceleration of the particle at $t = 2.0$ sec. [2]
- e) Explain the terms [2]
 - (i) Open system.
 - (ii) Closed system.
- f) A reversible refrigerator works between 0°C and 30°C . Calculate the coefficient of performance. [2]
- g) State the principle of Air conditioning. [2]
- h) Define critical temperature and critical pressure of the gas. [2]

Q2) Attempt any four of the following :

- a) What will be the workdone in blowing a soap bubble of radius 2 cm? The Surface Tension of soap solution is 0.035 N/m. [4]
- b) A bullet of mass 15 gm was moving with speed of 200 m/s. After passing through a solid substance it is continued to move at the rate of 50 m/s. How much work the bullet had to do in passing through a solid substance? [4]

P.T.O.

- c) Water Flowing in a horizontal pipe has speed of 20 cm/s at one end point and 15 cm/s at another point. Determine pressure difference between two points. [4]
- d) State and prove Work-energy Theorem. [4]
- e) What is Gravitational force? Give its properties. [4]
- f) Explain motion with constant acceleration. Obtain First Kinematical equation of motion. [4]

Q3) Attempt **any four** of the following:

- a) Calculate the workdone during an isothermal expansion of 4 mole of an ideal gas from a volume of 4 litres to 16 litres at 0°C. [4]
- b) State and explain second law of thermodynamics. [4]
- c) The efficiency of an Otto engine is 50%. If the value of γ for working substance is 1.5, find the compression ratio. [4]
- d) Give the difference between Real gases and Ideal gases. [4]
- e) Calculate the Van der Waal's constants for dry air. Given that $T_c = 135^\circ\text{K}$, $P_c = 37.4 \text{ atm}$, $R = 82.07 \text{ cm}^3 \text{ atm K}^{-1}$. [4]
- f) Explain construction and working of liquid filled thermometer. [4]

Q4) Attempt **any two** of the following:

- a) Discuss in detail the working of venturimeter. [8]
- b) (i) Describe in details Jeager's method to determine surface tension of liquid. [4]
- (ii) What force is required to accelerate 2000 kg car from 10 m/s to 40 m/s in time of 3 seconds? [4]
- c) (i) Define Non-conservative force. Give its examples. [4]
- (ii) A car covers a distance 100 m in 20 seconds while smoothly slowing down to a final speed 5.2 m/s. [4]
 - A) Find original speed.
 - B) Find its acceleration.

Q5) Attempt **any two** of the following:

- a) Obtain an expression for the efficiency of the Otto engine in terms of compression ratio. **[8]**
- b) (i) Derive an expression for workdone during an isothermal process. **[4]**
- (ii) Calculate the change in entropy when 12 gm of ice at 0°C is converted into water at the same temp.
[Latent heat of ice = 80 cal./gm] **[4]**
- c) (i) Describe Andrew's experiment on carbon-dioxide. **[4]**
- (ii) Determine what temperature on the centigrade scale is represented by the same number on the Fahrenheit scale. **[4]**



Total No. of Questions : 6]

[Total No. of Pages : 2

P458

[3817] - 30

F.Y. B.Sc. (Vocational)

BIOTECHNOLOGY

Biochemistry, Biophysics and Instrumentation - I

(Paper - I) (New Course)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Draw neat and labelled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use separate answer books for section I and II.*

SECTION - I

Q1) Answer the following questions in short : **[8]**

- a) Define isoenzymes.
- b) What are unsaturated fatty acids?
- c) What are the two types of ER?
- d) Enlist the components of RNA.

Q2) Answer any four of the following : **[16]**

- a) Give the classification of amino acids in brief.
- b) Describe how pH and temperature affect the enzyme activity.
- c) Write a note on functions of carbohydrates.
- d) How is glycolysis regulated by phosphofructokinase?
- e) What is the role of lipids?

Q3) Answer any two of the following : **[16]**

- a) What is Pentose Phosphate pathway? Describe in detail.
- b) Explain the TCA cycle.
- c) Discuss the two types of secondary structures of proteins.

P.T.O.

SECTION - II

Q4) Answer the following : **[8]**

- a) Give functions of condenser of compound microscope.
- b) Mention the role of buffer.
- c) Define radioisotope.
- d) State Lambert's law.

Q5) Attempt any four questions. **[16]**

- a) Explain working of pH meter.
- b) Give principle and applications of nephelometry.
- c) Describe dark field microscopy.
- d) Write a note on phase contrast microscope.
- e) Discuss the role of radioisotopes in biological sciences.

Q6) Attempt any two questions. **[16]**

- a) Describe parts of visible spectrophotometer with suitable diagram.
- b) Describe paper chromatography with respect to principle, technique and applications.
- c) Explain working of infrared spectrophotometer. Comment on its applications in biology.



Total No. of Questions : 6]

[Total No. of Pages : 2

P459

[3817] - 37

F.Y. B.Sc. (Vocational)

BIOTECHNOLOGY

Microbiology and Mathematics, Statistics and Computer for Biologists

(Paper - II) (New Course)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Draw neat labelled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use separate answer books for Section I and II.*

SECTION - I

(Microbiology)

Q1) Answer each of the following : **[8]**

- a) Define sterilization.
- b) What is pasteurization?
- c) Give two examples of enrichment media.
- d) Mention the roles of Flagella.

Q2) Attempt any four of the following : **[16]**

- a) Explain in brief bacterial growth curve.
- b) Enlist the contributions of Louis Pasteur.
- c) Describe autoclave with suitable diagram.
- d) Explain replica plate technique.
- e) Write a note on commensalism.

Q3) Attempt any two of the following : **[16]**

- a) What is pathogenesis? Explain the mechanism of bacterial pathogenicity.
- b) Give an account of physical and chemical agents used in sterilization.
- c) What is staining? Describe Gram positive staining technique.

P.T.O.

SECTION - II

(Mathematics, Statistics and Computer for Biologist)

Q4) Attempt each of the following : [8]

- a) If $y = \log x + \frac{1}{x} + e^{x^{3/2}}$, find $\frac{dy}{dx}$.
- b) Evaluate $\int 2xe^{x^2} dx$.
- c) Define mode and give an example.
- d) Make a list of output devices.

Q5) Attempt any four of the following : [16]

- a) Evaluate $\lim_{x \rightarrow -3} \left[\frac{1}{x+3} + \frac{3}{x^2+3x} \right]$
- b) Calculate standard deviation from the following data :
8, 10, 12, 11, 10, 15, 13, 10, 8, 9, 12, 13, 14, 12, 13, 10, 11.
- c) Find the limit of the sequence $\left\{ \frac{\sqrt{n}-1}{\sqrt{n}+1} \right\}_{n=1}^{\infty}$.
- d) What is correlation? Describe positive correlation with example.
- e) Write a note on binomial distribution.

Q6) Attempt any two of the following : [16]

- a) i) Evaluate $\int \frac{x^3}{2x+3} dx$
ii) Evaluate $\lim_{x \rightarrow 5} \frac{1 - \sqrt{x-4}}{x-5}$
- b) If $y = \log \frac{1 + \sqrt{x}}{1 - \sqrt{x}}$, find $\frac{dy}{dx}$.
- c) Describe the test for goodness of fit with suitable example.



Total No. of Questions : 5]

[Total No. of Pages : 3

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[3817] - 4

F.Y. B.Sc.

PHYSICS - II

Emerging Physics and Electricity and Magnetism

(11220) (Paper - II) (New Course)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of log tables and calculator is allowed.
- 4) Draw neat diagrams and sketches wherever necessary.

Q1) Attempt all of the following :

- a) Give in short, the contributions in physics by Robert Hooke. [2]
- b) Give any two applications of He-Ne- Laser. [2]
- c) Find the cardiac output for a person having heart rate of 72 beats/min and a stroke volume 65 ml per beat. [2]
- d) Define active transducer and give two examples. [2]
- e) Explain electric potential. [2]
- f) A closed curve encircles several conductors. The line integral $\oint \vec{B} \cdot d\vec{l}$ around the curve is $3.80 \times 10^{-4} \text{ Tm}$. What is the net current in the conductor?
Given : $\mu_0 = 4\pi \times 10^{-7} \text{ WbA}^{-1}\text{M}^{-1}$. [2]
- g) Explain magnetic permeability. [2]
- h) Explain transient current. [2]

Q2) Attempt **any four** of the following :

- a) Explain spontaneous emission and stimulated emission. [4]
- b) Give the contributions of Faraday in physics. [4]
- c) Explain construction and working of photo multiplier tube. [4]

P.T.O.

- d) Find the relative population of two states in a ruby laser that produces a light beam of wavelength 6943\AA at 300°K .
 [Given : $h = 6.626 \times 10^{-34}$ Js, $C = 3 \times 10^8$ m/s, $k = 8.61 \times 10^{-5}$ eV/ $^\circ\text{K}$.] [4]
- e) The membrane resistance of a cell is 0.1 ohm/m^2 and capacitance of about $1\mu\text{F/cm}^2$. Calculate the time constant of RC equivalent circuit. [4]
- f) A nanoparticle with drift velocity 1.5×10^3 m/s experiences a scattering after 4 picosecond. What will be the mean free path of that particle? [4]

Q3) Attempt any four of the following:

- a) What is electric intensity? Obtain an expression for electric intensity due to a point charge at any point. [4]
- b) Obtain an expression for magnetic induction on the axis of a current carrying circular coil. [4]
- c) Explain ferromagnetism on the basis of domain theory. [4]
- d) Calculate the potential energy of a system consisting of two point charges $3 \times 10^{-8}\text{C}$ and $-2 \times 10^{-8}\text{C}$ with a separation of 60 cm.
 [Given : $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 / \text{N} - \text{m}^2$] [4]
- e) The parallel plate capacitor of plate area 0.01 m^2 is filled with dielectric of dielectric constant 5. Its capacitance is $2 \times 10^{-10}\text{F}$ and it has been charged to 50 volts. Find electric field intensity in the dielectric. [4]
- f) An aluminium wire of diameter 0.4 cm carries a current of 25 ampere. Find the magnetic field at the surface of the wire.
 [Given : $\mu_0 = 4\pi \times 10^{-7} \text{ Wb/A-m}$] [4]

Q4) Attempt any two of the following:

- a) Discuss wet chemical method for synthesis of nano materials. [8]
- b) (i) Give contributions of Niels Bohr in physics. [4]
 (ii) The resistance of the platinum wire of a platinum resistance thermometer at ice point is 5 ohms and at steam point 5.93 ohms. When platinum wire is heated in a bath, its resistance is found to be 5.8 ohms. Calculate the unknown temperature. [4]

- c) (i) What is neuron? State its function. [4]
- (ii) A pulsed laser is constructed with a ruby crystal as the active element. The ruby rod contains typically a total of 2×10^{19} Cr^{+3} ions. If laser emits light at 6943 \AA wavelength, find (i) the energy of one emitted photon in eV and the total energy available per laser pulse.
[Given : $h = 6.626 \times 10^{-34} \text{ Js}$] [4]

Q5) Attempt **any two** of the following:

- a) State and prove Gauss's law in dielectrics. [8]
- b) (i) Define electrical line of force. Give properties of electrical lines of force. [4]
- (ii) An ideal solenoid of an aluminium core, has 50 turns per cm and a current 2A. Calculate the magnetization M developed in the core.
[Given : $\chi_{\text{aluminium}} = 2.3 \times 10^{-5}$] [4]
- c) (i) State and explain Biot-Savart's law. [4]
- (ii) When current of 10 A is flowing through a resistance of 20 ohm and inductance of 5 H, the battery is switched off. Find the current after 0.2 s. [4]



Total No. of Questions : 5]

[Total No. of Pages : 2

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[3817]-8

F.Y. B.Sc.

BOTANY

Plant Resources - Management and Utilization

(41420) (Paper - II) (New Course)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat labelled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt the following :

[16]

- a) What is bioenergy?
- b) Enlist methods of irrigation used in a nursery.
- c) Which climatic factors are regulated in the greenhouse?
- d) Define artificial ripening.
- e) Mention three lines of Ikebana.
- f) Define weeds.
- g) Mention two advantages of biocontrol.
- h) Give two examples of dye yielding plants.

Q2) Answer any four of the following :

[16]

- a) Describe types of manures used in nursery.
- b) Comment on structural material used for construction of greenhouse.
- c) Describe harvest technology applied for flowers.
- d) Write uses of weeds.
- e) Describe methods of vase life improvement.
- f) Write an account of Indiar.

P.T.O.

Q3) Write short notes on any four of the following: [16]

- a) Seed and propagule selection.
- b) Advantages of greenhouse technology.
- c) Maturity indices.
- d) Chemical control of weeds.
- e) Bouquet.
- f) Biocontrol as agrobusiness.

Q4) Answer any two of the following: [16]

- a) Describe any four unprocessed plant resources.
- b) Give an account of sea weeds as a potential resource.
- c) Describe gums and tannins as minor forest products.
- d) Describe part used, products and uses of Aloe and Turmeric.

Q5) Describe natural vegetative parts used for plant propagation. [16]

OR

What is phytoremediation? Explain the strategies used for phytoremediation.



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[3817] - 14

F.Y.B.Sc.

STATISTICS / STATISTICAL TECHNIQUES
Discrete Probability and Probability Distributions
(Paper - II) (2008 Pattern)

*Time : 3 Hours]**[Max. Marks :80**Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of statistical tables and calculator is allowed.*
- 4) *Symbols have their usual meanings.*

Q1) a) Choose correct alternative for the following: **[4 × 1 = 4]**

- i) If A and B are two events defined on Ω , such that $P(A \cup B) = 5/6$, $P(A \cap B) = 2/6$, and $P(A) = 1/2$ then $P(B)$ is equal to
 A) $2/3$ B) $1/3$
 C) $1/2$ D) 1
- ii) For a poisson distribution if $P(X = 2) = P(X = 1)$, then the parameter of the distribution is
 A) 1 B) 2
 C) 3 D) 4
- iii) If X and Y denote the points obtained when two six face unbiased dice are thrown, then $P(X = Y)$ is
 A) $1/2$ B) $1/6$
 C) $1/24$ D) $1/36$
- iv) Which of the following distribution has two parameters?
 A) Discrete uniform B) Bernoulli
 C) Poisson D) Binomial.

b) State whether the following statements are true or false: **[4 × 1 = 4]**

- i) Variance is affected by change of origin.
- ii) Mean and variance are not equal for poisson distribution.
- iii) If $A \subset B$, then $P(A/B) = \frac{P(A)}{P(B)}$.
- iv) Conditional probability satisfies axioms of probability.

- c) If $X \rightarrow B(n, p)$ with $n = 25$, $E(x) = 10$ find parameter p and $\text{var}(x)$. [2]
- d) Define: [2]
- i) Mutually Exclusive events.
 - ii) Independent events.
- e) Prove that variance of a constant is Zero. [2]
- f) Define discrete sample space. [2]

Q2) Attempt any four of the following: [4 × 4 = 16]

- a) If A and B are any two events defined on Ω , then prove that:
 $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- b) State the axioms of probability. For any two events A and B . Defined on Ω , show that:

$$P(A \cap B) \leq \min [P(A), P(B)]$$

- c) The following is probability distribution of a discrete random variable X .

X	0	1	2	3
$P(X=x)$	1/6	1/3	1/3	1/6

Obtain $E(X)$ and $\text{Var}(X)$.

- d) Define:
- i) Pairwise independence and
 - ii) Complete independence of three events.
- e) State and prove Baye's theorem.
- f) For the following probability distribution of a random variable X .

X	2	4	6	8	10
$P(X=x)$	1/12	1/6	1/4	1/3	1/6

Find:

- i) Median,
- ii) Mode,
- iii) $P(X \geq 6)$.

Q3) Attempt any four of the following: [4 × 4 = 16]

- a) If X and Y are two discrete random variables, then prove that :
 $E(X + Y) = E(X) + E(Y)$
- b) Define:
- i) Partition of the sample space.
 - ii) Conditional Probability.

- c) Let $\Omega = \{a, b, c, d, e, f, g, h\}$ with probability model given below:

Sample Point	a	b	c	d	e	f	g	h
P	0.10	0.20	0.15	0.05	0.25	0.10	0.10	0.05

If $A = \{a, b, d\}$, $B = \{b, c, e, f\}$ be two events defined on Ω .

Find:

- i) $P(A \cup B)$.
 - ii) $P(A \cap B)$.
 - iii) $P(B)$.
 - iv) $P(A/B)$.
- d) For the following joint probability distribution of (X, Y)

X\Y	0	1	2
0	1/4	0	1/4
1	1/16	1/16	1/8
2	1/16	1/16	1/8

Find:

- i) Marginal probability distribution of X.
 - ii) Marginal probability distribution of Y.
 - iii) Conditional probability distribution of $X/Y = 1$.
- e) Let X be a discrete r.v. with p.m.f.

$$P(X = x) = \frac{x}{15}; x = 1, 2, 3, 4, 5$$

$$= 0, \text{ otherwise}$$

Find:

- i) $E(X)$.
 - ii) $\text{Var}(2X)$.
- f) If A and B are independent events, then prove that:
- i) A and B' are also independent.
 - ii) A' and B are also independent.

Q4) Attempt any two of the following.

[2 × 8 = 16]

- a) i) Give the classical definition of probability. State its limitations.
- ii) State and prove additive property of binomial distribution.

- b) i) An integer is chosen at random from 1 to 100 what is the probability that it is not divisible by 7.
- ii) A pair of fair dice is thrown, if the two numbers appearing on top faces are different, find the probability that the sum of numbers on the top faces is 4.
- c) i) A r.v. x was the following p.m.f.

$$P(x = x) = \frac{1}{n}, x = 1, 2, 3, \dots, n$$

$$= 0, \text{ otherwise}$$

Find:

- i) $E(x)$
- ii) $E(2x + 3)$
- ii) Define Bernoulli distribution with parameter p , find its mean and variance.
- d) For the following joint probability distribution of (x, y) . Compute correlation coefficient between x and y .

X\Y	0	1	2
-1	1/6	0	1/12
1	1/4	1/3	1/6

Q5) Attempt any Two of the following: **[2 × 8 = 16]**

- a) i) Define Hypergeometric distribution and find its mean.
- ii) A box contains 6 blue and 3 red balls. 3 balls are chosen at random without replacement. Find the probability that:
- I) No red ball is chosen,
- II) At least one red ball is chosen.
- b) Let $x \rightarrow B(n, p)$ obtain mean and variance of x .
- c) i) If X and Y are independent discrete random variables such that, $\text{var}(X) = 2$, $\text{var}(Y) = 4$ then compute
- I) $\text{Var}(3X + 4Y)$.
- II) $\text{Var}(3X - 2Y + 10)$.
- ii) Three coins are tossed and whether each shows head or tail is recorded. Consider the following events:
- A : Exactly two coins show tails.
- B : At least two coins show tails.

Write the expressions for the following events. Also list their elements:

- I) Occurrence of at least one event.
- II) Occurrence of both the event.
- III) Occurrence of none of the event.

- d) i) The probability distribution of a discrete random variable x is given by

X	- 2	- 1	1	2
P (X = x)	1/3	1/6	1/6	1/3

find third central moment μ_3 . Also comment on the nature of the distribution.

- ii) Define conditional expectation and conditional variance of $X/Y = y$ for a bivariate random variables (X, Y).



Total No. of Questions : 5]

[Total No. of Pages : 2

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[3817]-11

F.Y. B.Sc.

GEOLOGY - I

Mineralogy and Petrology

(Revised Course) (2008 Pattern) (Paper - I)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions :

[16]

- a) Define Atom and Ion.
- b) Define the term fracture.
- c) What is polymorphism?
- d) Define mineral.
- e) What is twinkling?
- f) What is magma?
- g) What is open form?
- h) Define porphyritic texture.

Q2) Answer the following questions (any four) :

[16]

- a) Explain the tectosilicate structure with suitable examples.
- b) Give an account of minerals used in paint industry.
- c) Explain the evaporation and precipitation process of mineral formation.
- d) Explain the covalent bonding in minerals with suitable examples.
- e) Explain the magnetic properties of minerals.
- f) Explain the importance and conservation of minerals.

Q3) Answer the following questions (any four) :

[16]

- a) Explain Bowen's reaction series.
- b) Describe the Argillaceous sedimentary rocks.
- c) Give classification of Igneous rocks based on its mode of occurrence.
- d) Explain various agents of metamorphism.
- e) Describe the texture of conglomerate and limestone.
- f) Explain the terms :
 - i) Petrology.
 - ii) Petrography.
 - iii) Petrogenesis.
 - iv) Lithology.

P.T.O.

Q4) Answer the following questions (any two) : **[16]**

- a) Give the silicate structure, chemical composition, physical and optical properties of 'Augite'.
- b) Explain the graded bedding and Ripple mark structures in sedimentary rocks.
- c) Explain any two discordant Igneous intrusions.
- d) Explain the various optical properties of minerals seen in between crossed nicols.

Q5) Give the crystallographic axes, elements of symmetry, definition with indices of various forms present in Tetragonal System, type zircon. **[16]**

OR

- a) Explain the structures in metamorphic rocks.
- b) State the different physical properties of minerals. Explain colour and lustre with suitable examples.



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[3817]-12

F.Y. B.Sc.

GEOLOGY - II

**General Geology and Palaeontology
(New Revised Course) (2008 Pattern) (Paper - II)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions : [16]

- a) Give the names of the major tectonic plates of the earth.
- b) Define Ichnology.
- c) What are fold mountains?
- d) Define Weathering.
- e) Define Geology.
- f) Define Columella.
- g) Give the principles of tidal theory of origin of solar system.
- h) What are cephalopods?

Q2) Answer any four questions from the following : [16]

- a) What are Sea Arch and stacks?
- b) Describe various types of sand dunes.
- c) Give the products of volcanic activity.
- d) Types of septa in corals.
- e) Enumerate different forms of gastropods.
- f) Explain the apical disc of Echinus.

Q3) Answer any four questions from the following : [16]

- a) Give the effects of earthquake.
- b) Explain Head and Pygidium of Trilobites.
- c) Explain lithosphere and Biosphere.
- d) Give the Systematic position and geological of distribution class Gastropoda.
- e) Give the techniques used in illustration of fossils.
- f) Describe the Uranium-Thorium method of age determination.

Q4) Answer any two questions from the following : **[16]**

- a) Explain the structure of a central type of volcanic eruption.
- b) Describe the Airy's hypothesis of Isostasy.
- c) Describe the morphology of the hard parts of Lamellibranch.
- d) Give the morphology and geological distribution of Belemnites.

Q5) Describe the various depositional landforms of glaciers. **[16]**

OR

- a) Explain different modes of preservation of fossils. **[8]**
- b) Give the comparison between the Brachiopods and Lamellibranchs. **[8]**



Total No. of Questions : 5]

[Total No. of Pages : 2

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[3817]-15

F.Y. B.Sc.

GEOGRAPHY - I

**Gg - 110 : Physical Geography
(New Course) (Paper - I)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Draw neat diagrams and sketches wherever necessary.*
- 4) *Use of map stencils is allowed.*

Q1) Answer the following questions in two to four sentences :

- a) Define volcano.
- b) Write two branches of physical geography.
- c) What is fault?
- d) What is Lacolith?
- e) What is glacier?
- f) What is magma?
- g) What is seismometer?
- h) What is sea cave?

Q2) Explain the following in brief (any four) :

- a) Characteristics of metamorphic rocks.
- b) Explain sea floor spreading.
- c) Explain flood plains and levees.
- d) Explain evidences of "Continental Drift Theory".
- e) Explain difference between Sedimentary and Igneous rocks.
- f) Explain weathering and its type.

Q3) Answer the following (any four) :

- a) Block mountain.
- b) Biological weathering.
- c) Yardangs.
- d) Sea arch and sea stacks.
- e) Types of fold.
- f) Major earthquake regions of the world.

PTO.

Q4) Attempt the following (any two) :

- a) Importance of “Plate Tectonic Theory”.
- b) Landforms associated with glacial erosion.
- c) Mass movement.
- d) Landforms associated with wind deposition.

Q5) Explain the mechanism of river erosion and erosional features of the river with neat diagrams.

OR

Write a geographical essay on “Interior of the earth”.



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[3817] - 17

F.Y. B.Sc.

MICROBIOLOGY

INTRODUCTION TO MICROBIOLOGY

(Paper-I) (New course) (2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Draw neat labelled diagrams wherever necessary.*
- 3) Figure in bracket indicates full marks.*

Q1) Attempt the following:

[16]

- a) Who discovered 'salvarsan' which was termed 'Magic bullet' to treat patient's suffering from syphilis disease?
- b) ___ group of bacteria are obligate intracellular parasites.
- c) ___ represents archaebacterial group.
 - i) Pneumococcus.
 - ii) Methanogens.
 - iii) Bacillus.
 - iv) Clostridium.
- d) Match the following.

i) Monosaccharide.	1) Dextrin.
ii) Disaccharide.	2) Glucose.
iii) Oligosaccharide.	3) Glycogen.
iv) Polysaccharide	4) Lactose.
- e) The solution of pH 4 is ___ times more acidic than solution of pH 6.
 - i) 10.
 - ii) 100.
 - iii) 2.
 - iv) 20.
- f) What is the function of Gas vacuoles in bacteria?
- g) Define 'Plasmid'.
- h) "The bond present between two nucleotides of nucleic acid is called phosphodiester bond". (True / False).

P.T.O.

Q2) Attempt any Four of the following: [16]

- a) What are prions? Give it's clinical significance.
- b) Explain ionic bond formation with suitable example.
- c) What are bacteriophages? Write characteristic's of lambda phage.
- d) Justify "Endospore forming bacteria are resistant to unfavourable environmental conditions".
- e) State "Koch Postulates".
- f) Enlist the steps in Life Cycle of Plasmodium.

Q3) Attempt any Four of the following: [16]

- a) Describe the historical background in the development of concept of "surgical antisepsis".
- b) Write short note on 'Viroids'.
- c) Write morphological characters and role of Lactobacillus in human health.
- d) Write short note on biochemical reactions in cell.
- e) Draw neat labelled diagram of flagella of Gram negative bacteria.
- f) What are metachromatic granules? Give their significance in bacterial cell.

Q4) Attempt any two of the following: [16]

- a) Write general characters of Saccharomyces and draw neat-labelled diagram representing it's Life cycle.
- b) Explain the structure of cell wall of Gram negative bacteria.
- c) What are protozoa? Describe the general character of protozoa and give any four example.
- d) Describe contribution of Louis pasteur in the development of concept of vaccination.

Q5) Attempt any One of the following: [16]

- a) Define Lipids. Enlist various classes of Lipids and describe their structure and biological function.
- b) Define biogenesis and a biogenesis. Describe the experiments done by F.Reddi and J.Tyndall to disprove abiogenesis.



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[3817] - 18

F.Y. B.Sc.

MICROBIOLOGY

**Basic Techniques In Microbiology
(Paper-II) (New course) (2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Draw neat labelled diagrams wherever necessary.*
- 3) Figures in brackets indicate full marks.*

Q1) Attempt the following:

[16]

- a) Name any two culture collection Centre.
- b) In ____ microscopy the object appears dark against bright background.
i) Brigh field ii) Dark field iii) Both iv) None
- c) Define generation time of bacteria.
- d) Enlist any two examples of hazardous chemicals used in laboratory ____.
- e) Synchronous cultures remain in the same phase for a long period of time-state whether true or false.
- f) Pasteurization process is the example of sterilization-state whether true or false.
- g) Enlist the two constructional changes made in phase contrast microscope.
- h) Which mordant is used in gram staining.

Q2) Attempt any Four of the following:

[16]

- a) Define acidic and basic dye. Give two examples of each.
- b) Draw properly ray diagram of Scanning electron microscope.
- c) Describe how pour plate technique is used for the isolation of bacteria.

P.T.O.

- d) Represent diagrammatically the Helmstetter cummings Techniques for getting synchronous culture.
- e) Describe the phenomenon of catabolite repression.
- f) Describe spherical aberration.

Q3) Attempt any Four of the following: **[16]**

- a) Give any two examples and their mode of action of quaternary ammonium compounds.
- b) Enlist the different methods of endospore staining. Describe any one method in detail.
- c) What is specific growth rate. Derive an equation of growth rate.
- d) Compare and contrast TEM and SEM.
- e) What are safety precautions that should be taken in microbiology laboratory.
- f) Describe the different methods of maintenance of bacterial culture.

Q4) Attempt any two of the following. **[16]**

- a) Explain principle, working with ray diagram of fluorescent microscopy.
- b) Define continuous culture. Explain two models of continuous culture.
- c) What are extremophiles? Explain the methods used for the cultivation of thermophiles.
- d) Define differential staining. Explain principle and methodology of acid fast staining.

Q5) Attempt any One of the following: **[16]**

- a) Describe different phases and subphases of bacterial growth with graphical representation.
- b) What is sterilization? Describe the process of sterilization by heat.



P106

[3817] - 19
F.Y. B.Sc.
PSYCHOLOGY
General Psychology
(Paper-I) (New)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Draw the figures and diagrams wherever necessary.*
- 3) All questions carry equal marks.*

Q1) Attempt all 8 questions in one or two sentences.

[16]

- a) What is correlation?
- b) Define psychology.
- c) Define perception.
- d) What is illusion?
- e) Define personality.
- f) Give the full form of T.A.T.
- g) Define forgetting.
- h) What is interference?

Q2) Answer the following questions in 6/8 sentences (any - 4).

[16]

- a) Explain neurotransmitters.
- b) Explain perceptual constancies.
- c) Discuss the geometrical illusion.
- d) Describe Allport's Theory.
- e) Describe Thorndike's Laws of learning.
- f) Explain Spearman's two factor theory.

P.T.O.

Q3) Attempt the following questions in 6/8 sentences (any-4). **[16]**

- a) Describe the method of observation.
- b) Explain autonomous nervous system.
- c) Discuss figure and ground perception.
- d) Explain Rorschach's Ink-Blot Test.
- e) Describe the big-five model theory.
- f) Describe Binet's test for children.

Q4) Answer any two of the following questions. **[16]**

- a) Explain the applications of psychology.
- b) Describe structure and function of human brain.
- c) Describe the concepts of classical conditioning.
- d) Discuss the measurement of Intelligence.

Q5) Define motivation. Explain the types of physiological motives. **[16]**

OR

Define memory. Explain the types of memory.



P107

[3817]-20

F.Y. B.Sc.

PSYCHOLOGY

**Experimental Psychology and Psychological Testing
(New) (Paper - II)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw the figures and diagrams wherever necessary.*
- 3) *All questions carry equal marks.*

Q1) Attempt all 8 questions in one or two sentences :

[16]

- a) Define variable.
- b) Define experiment.
- c) Define reaction time.
- d) State the characteristics of good psychological test.
- e) What is the formula of IQ?
- f) Define intelligence.
- g) What is psychological test.
- h) Define foreperiod.

Q2) Answer the following questions in 6/8 sentences (any 4) :

[16]

- a) Explain the set and attitudes of the reactor.
- b) Describe the trial and error in problem solving.
- c) Explain norms of psychological test.
- d) Describe various stages of problem solving.
- e) Enlist the self report inventories.
- f) Explain the sentence completion test.

- Q3)** Answer the following questions in 6/8 sentences (any 4) : **[16]**
- a) Discuss the experimental and control group.
 - b) Explain insight behaviour and problem solving.
 - c) Illustrate Strong-Campbell interest inventory.
 - d) Describe the Thematic Apperception Test.
 - e) Discuss the learning to solve problems.
 - f) What is measured by intelligence test? Explain M.A. & C.A.

- Q4)** Answer any two of the following questions : **[16]**
- a) Explain independent and dependent variables.
 - b) Discuss the uses of psychological test.
 - c) Describe Wechsler's intelligence scale for children.
 - d) Enumerate the types of reaction time.

- Q5)** Define Psychophysics. Explain basic concept of psychophysics. **[16]**

OR

Define reliability. Discuss the various types of reliability.



P108**[3817]-21****F.Y. B.Sc.****ELECTRONIC SCIENCE****EL1-T1 - Principles of Analog Electronics
(New Course) (Paper - I) (2008 Pattern)***Time : 3 Hours]**[Max. Marks : 80**Instructions to the candidates:*

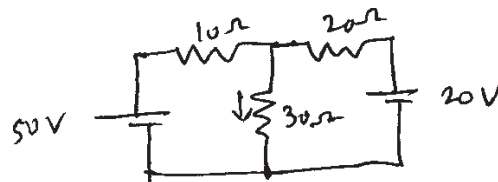
- 1) *All questions are compulsory.*
- 2) *Draw neat labelled diagram wherever necessary.*
- 3) *Use of log tables/calculators is allowed.*
- 4) *Figures to the right indicate full marks.*

Q1) Answer the following questions in brief : **[16]**

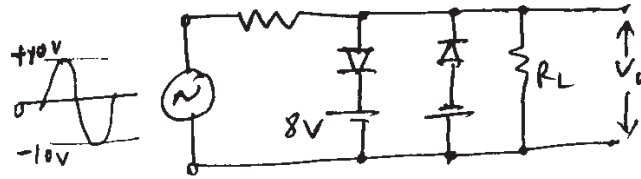
- a) Draw circuit symbols for - LDR, Gang capacitor.
- b) Define inductance of an inductor. Draw symbol of iron core inductor.
- c) What is fuse? Why it is called safety device?
- d) Define ideal voltage and current sources.
- e) What are clipper and clamper circuits?
- f) State KVL and Norton's theorem.
- g) "FET is called voltage controlled device", comment.
- h) Give the important characteristics of opamp.

Q2) Answer any four of the following : **[16]**

- a) What is transformer? State its working principle with necessary formula.
- b) Explain the action of RC circuit as differentiator.
- c) Use superposition theorem to find current through 30Ω resistor.



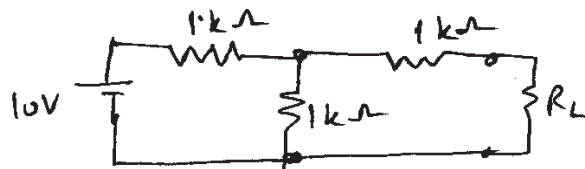
- d) Draw circuit diagram of Half wave rectifier. Show that its efficiency $\eta = 40\%$.
- e) Explain working of following circuit and show output waveform.



- f) Explain the action of opamp as inverting amplifier.

Q3) Attempt any four of the following : **[16]**

- a) Write short note on cadmium standard cell.
- b) In a series LCR circuit $L = 420 \mu\text{H}$, $C = 30\text{pF}$, $R = 25 \Omega$, calculate resonant frequency f_0 .
- c) Obtain Thevenin equivalent circuit of the following circuit and hence find the load current.



- d) Explain construction and working of LED.
- e) What do you mean by transistor biasing? Explain voltage divider biasing.
- f) Explain use of an opamp as an integrator.

Q4) Attempt any two of the following : **[16]**

- a) i) Identify the values of following resistors and capacitors.
- 1) Black, brown, gold, gold.
 - 2) Yellow, violet, yellow, gold.
 - 3) 104.
 - 4) 1K5.
- ii) Show that in inductive circuit, current lags behind the voltage.
- b) i) Find the value of R_L for maximum power transfer in the following circuit.



- ii) Draw the circuit symbols of npn and pnp transistors. Explain the operation of pnp transistor with proper biasing circuit in CB configuration.
- c) i) Explain action of SCR with gate terminal open.
- ii) Describe use of zener diode as voltage regulator.

Q5) Attempt any two of the following : **[16]**

- a) i) Obtain the relation between α and β of transistor.
- ii) Explain working of low pass and high pass filters.
- b) i) Describe working of UJT as relaxation oscillator.
- ii) Draw circuit symbols of Diac and Triac. Draw their IV characteristics.
- c) i) The arms of T network has $R_1 = 10\Omega$, $R_2 = 20\Omega$ and $R_3 = 30\Omega$. Find equivalent π network.
- ii) Write a short note on transistor as inverter.



P109

[3817]-22

F.Y. B.Sc.

ELECTRONIC SCIENCE

**EL1-T2 : Principles of Digital Electronics
(New Course) (2008 Pattern) (Paper - II)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagram must be drawn wherever necessary.*
- 3) *Use of calculator and log table is allowed.*
- 4) *Figures to right indicate full marks.*

Q1) Answer the following questions in brief : **[16]**

- a) State the different units of Binary data storage.
- b) Draw the logic circuit for OR gate using NAND gate.
- c) What are BCD and binary codes? Write BCD and binary code for decimal 14.
- d) What is multiplexer? Write its application.
- e) List the performance characteristics of IC logic family.
- f) Write the basic rules for Boolean addition.
- g) Perform the subtraction using 1'S complement $(32)_{10} - (15)_{10}$.
- h) State the function of present and clear of J-K flip-flop.

Q2) Answer any Four of the following : **[16]**

- a) Draw logic diagram of two input NOR gate using diodes. Write its truth table.
- b) Explain the method of converting gray to binary and convert (101101) gray to $(?)_2$.
- c) Draw the logic circuit for following Boolean equation using basic logic gates.
 - i) $Y = AB + BC + CD$.
 - ii) $Y = (A + B).(\bar{A} + C)$.
- d) What is half subtractor? Draw its logic circuit and truth table.

- e) Draw the logic circuit of clocked R-S flip-flop. Write its truth table.
- f) Explain Read only Memory.

Q3) Attempt any Four of the following : **[16]**

- a) Write a short note on noise immunity.
- b) What is decoder? Explain BCD to seven segment decoder.
- c) Draw the logic circuit of two input TTL NAND gate. Give significance of diode used in it.
- d) Draw the circuit of transistor inverter. Explain its operation and truth table.
- e) Simplify the following expression using Demorgan's theorem
 - i) $\overline{\overline{A + B + C}}$
 - ii) $\overline{\overline{A + B + CD}}$
- f) Define the term Modulus of a counter. Design Mod 12 counter using flip-flop.

Q4) Attempt any two of the following : **[16]**

- a) i) Perform following subtraction using 2's complement method.
 - 1)
$$\begin{array}{r} 37 \\ -18 \\ \hline \end{array}$$
 - 2)
$$\begin{array}{r} 24 \\ -20 \\ \hline \end{array}$$
- ii) Explain the Structural Memory Organization of a chip.
- b) i) What is encoder? Draw logic circuit of decimal to BCD encoder.
- ii) Draw the circuit of CMOS NOR gate. Explain its action.
- c) i) Draw the logic diagram of 1:4 line Demultiplexer. Explain its action with truth table.
- ii) In a 4 stage ripple counter, if propagation delay of flip-flop is $10ns$ and if pulse width of the strobe is $20ns$, find maximum frequency at which counter can operate reliably.

Q5) Attempt any two of the following : **[16]**

- a) i) Simplify the following Boolean equation using K-Map and then draw logic diagram.

$$Y = ABC\bar{C} + ABC + BC$$
- ii) Explain SISO shift register using suitable diagram.

- b) i) Draw the circuit diagram of 3 bit ripple counter. Explain its operation.
ii) Why NAND gate is called universal gate? Design NOR gate using only NAND gates.
- c) i) Explain 4:1 line multiplexer with logic diagram and truth table.
ii) Convert the following :
- 1) $(10011.10)_2 = (?)_{10}$
 - 2) $(218)_{10} = (?)_{16}$



P110

[3817]-23

F.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS-1 : War and Warfare

(New Course)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Answer in 20 words (Any Ten) :

[20]

- a) Define 'Conventional War'.
- b) What is 'Civil War'?
- c) Who was Mao Tse Tung?
- d) Define 'Propaganda'.
- e) Define 'Preemptive Attack'.
- f) What is 'Offensive Warfare'?
- g) Define Katuyudha (concealed war).
- h) Categorise the period of warfare.
- i) Define 'Theory of Force'.
- j) Define 'National Security'.
- k) Define 'Strategy'.
- l) What is 'White operation' in Psy War?
- m) Introduce LIC.

Q2) Answer in 50 words (Any Two) :

[10]

- a) Explain the concept and process of Brain Washing.
- b) Explain the social causes of war.
- c) Explain the political causes of war.
- d) Explain the consequences of war.

Q3) Answer in 150 words (Any Two) : **[20]**

- a) Why it is difficult to control LIC in democracy?
- b) Discuss the classifications of war.
- c) Discuss the phases of Guerilla warfare.
- d) Discuss various economic aspects of defence.

Q4) Answer in 300 words (Any Two) : **[30]**

- a) Explain the applications of information warfare.
- b) Discuss the principles of war.
- c) Write an essay on Psychological warfare.
- d) “National Security is a relative freedom from harmful threats”. Discuss it in the changing perspective of warfare.



P111

[3817]-24

F.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

**DS-2 : Defence Mechanism and Military Career in India
(New Course)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Answer in 20 words (Any Ten) :

[20]

- a) What are the functions of chief of Defence Staff Committee?
- b) Where Army headquarter is located?
- c) Who is the supreme commander of the Armed Forces?
- d) Write any two aims of the Indian Armed Forces.
- e) What are the limitations of Infantry?
- f) What is the main functions of Artillery?
- g) Write any two roles of the supporting arms.
- h) What do understand by the term 'Naval Ensign'?
- i) When Indian Naval ships were deployed for action for the first time?
- j) Explain the meaning of Second Line Defence.
- k) Define Intelligence.
- l) Write full form of BSF & CRPF.
- m) Write any two duties of Territorial Army.

Q2) Answer in 50 words (Any Two) :

[10]

- a) Explain various types of Air-crafts.
- b) Describe various types of Battle ships.
- c) Explain powers of President in relation to the armed Forces.
- d) Discuss Functions of Defence Committee of the cabinet.

Q3) Answer in 150 words (Any Two) : **[20]**

- a) Explain principle of Defence Organisation.
- b) Discuss functions of Ministry of Defence.
- c) Explain importance of Administrative Services in war.
- d) Discuss role of Indian Navy in peace & war.

Q4) Answer in 300 words (Any Two) : **[30]**

- a) Explain career options in Indian Army.
- b) Discuss career options in Intelligence Organisation.
- c) Describe role of CRPF & BSF in internal security of our country.
- d) Explain role and limitations of Infantry.



P112

[3817] - 25

F.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS.No. - III: Evolution of Defence Science and Technology

(New Course)

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Answer in 20 words each (Any Ten):

[20]

- a) Define "Science".
- b) State the meaning of Catapult.
- c) Write any two names of small fire arms.
- d) What do you understand by Standing Army?
- e) Define "Sea power".
- f) Who invented the submarine?
- g) Write the duration of world war - I.
- h) What do you mean by stealth?
- i) What do you understand by I.T?
- j) Define "Missile".
- k) What do you mean by Energy Resources?
- l) Write the long form of I.C.B.M.
- m) What do you mean by Radar?

Q2) Answer in 50 words (Any Two):

[10]

- a) Explain the basic cause for beginning of modern warfare.
- b) Write a few lines on "Strategy".
- c) Explain the concept of "Total War".
- d) Write in brief a concept of Air Power.

P.T.O.

Q3) Answer in 150 words (Any Two): [20]

- a) Analyse the causes of emergence of “General Staff”.
- b) Explain the theory of Marshall Foch with special reference to the “Trench warfare” during world war - I
- c) Write a brief essay on “Indias Missile Status”.
- d) Explain the linkages between “Energy Security & National Security”.

Q4) Answer in 300 words (Any Two): [30]

- a) What were the implications of Science & Technology on contemporary warfare?
- b) Describe the role of Tank during world war - I
- c) Discuss in detail the Low Intensity Conflict in Indias North-East region.
- d) Explain the dawn of “Nuclear Era” with special reference to the end of world war second.



P113

[3817] - 26

F.Y. B.Sc.

ENVIRONMENTAL SCIENCE

ENV - 101 Life Sciences - Basic Biology and Natural Resources

(Paper - I) (New) (2008 Pattern) (Theory)

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat labelled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt the following.

[16]

- a) What are fossil fuels?
- b) Enlist minerals present in the soil.
- c) What is nomenclature?
- d) Give importance of non renewable resources.
- e) Define biotic resources.
- f) What is continental drift?
- g) Give any four examples of epiphytes.
- h) Enlist the branches of biology.

Q2) Answer any four of the following.

[16]

- a) Write about patterns of life in the past.
- b) Explain concept of species.
- c) Describe global distribution of fresh water.
- d) Explain any two forest resources.
- e) Enlist ecological adaptations of halophytes.
- f) Explain any two causes of world food problem.

P.T.O.

Q3) Write short notes on any four of the following. [16]

- a) Aims of taxonomy.
- b) Floods and droughts.
- c) Impact of fossil fuels.
- d) Mineral resources of India.
- e) Distribution of life on earth.
- f) Scope of biology.

Q4) Attempt any two of the following. [16]

- a) Describe the sources of fresh water for terrestrial life.
- b) Write about palaeontological evidences of plant evolution.
- c) Explain classification of animals based on form relationship.
- d) Describe forest as renewable resource.

Q5) What are energy resources? Differentiate between conventional and nonconventional energy resources and add a note on alternative energy resources. [16]

OR

What are life forms? Describe microbial life in soil.



P114

[3817] - 27

F.Y.B.Sc. (Theory)

ENVIRONMENTAL SCIENCE

(ENV-102) Earth Sciences: Environmental Chemistry and Basic
Geosciences

(Paper - II) (New Course) (2008 Pattern)

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Draw neat labelled diagrams wherever necessary.
- 3) Figures to the right indicate full marks.

Q1) Attempt the following.

[16]

- a) Enlist causes of global warming.
- b) What is solubility product?
- c) Define precipitation.
- d) Enlist types of soil.
- e) What is a rock cycle?
- f) Give the names of classes of pesticides.
- g) Define atmospheric pressure.
- h) What are carcinogens?

Q2) Answer any four of the following.

[16]

- a) Discuss pollution problems of pesticides.
- b) Explain consequences of Hydrocarbons.
- c) Write a note on toxicity of 'Aflatoxin'.
- d) Discuss internal structure of earth.
- e) What is Lapse rate? Add a note on 'atmospheric stability'.
- f) Describe basic minerals of rocks.

P.T.O.

Q3) Write short notes on any four of the following. [16]

- a) Cyanides.
- b) Effects of Lead on Environment.
- c) Acid-Base Reactions.
- d) Types of rock.
- e) Factors affecting wind.
- f) Temperature Inversion.

Q4) Attempt any two of the following. [16]

- a) Describe physical and chemical properties of Mercury.
- b) What are surfactants? Add a note on types of surfactant with suitable examples.
- c) Define soil. Explain chemical properties of soil.
- d) Explain in detail process of oceanic crust Formation.

Q5) Discuss the chemistry of water. Explain in detail basic reversible and irreversible reactions in water. [16]

OR

Define atmosphere. Discuss structure and chemical composition of atmosphere.



P116

[3817]-29

F.Y. B.Sc. (Vocational)
INDUSTRIAL CHEMISTRY - I
(Paper - I) (Theory)
(2008 Pattern) (New)

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *All questions carry equal marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*
- 7) *All questions are compulsory.*

SECTION - I

Q1) Answer the following: **[8]**

- a) Define colloidal solution.
- b) Why the catalytic activity is more in finely divided condition of catalyst?
- c) Define adsorption.
- d) Where are the following catalysts used?
 - i) Ni,
 - ii) AlCl₃

Q2) Answer any two of the following: **[8]**

- a) What are promoters? Explain promotion action.
- b) Explain active centres on catalyst surface.
- c) Give two examples each of acid and base catalysed reactions.

Q3) Answer any two of the following: **[8]**

- a) Explain Tyndal effect.
- b) Explain following with examples.
 - i) Micells,
 - ii) Surtactants.
- c) What is adsorption isotherm. Explain Freundlich adsorption isotherm with graph.

P.T.O.

- Q4)** Answer any one of the following: [8]
- What are enzymes? Write down the mechanism of enzyme catalysis suggested by Michaelis and Menten. Give one example of enzyme catalysis.
 - Explain Phenomenon of
 - Electrophoresis.
 - Electroosmosis.

- Q5)** Write short note on any two: [8]
- Coagulation.
 - Phase transfer catalysis.
 - Gels.
 - Negative catalysis.

SECTION - II

- Q6)** Define and explain the following terms: [8]
- Number of components.
 - Heat and work.
 - Derived quantities.
 - Volume percent.

- Q7)** Answer any two of the following: [8]
- Describe various methods to express the composition of solutions.
 - Write a note on adiabatic flame temperature.
 - Explain the operation of distillation with material balance.

- Q8)** Write short notes on any two of the following: [8]
- Excess reactant and percent excess.
 - Purge ratio.
 - Mean molal heat capacities of gases.

- Q9)** Answer any one of the following: [8]
- State Amagat's Law and derive the relationship between partial pressure and mole fraction of component gas to total pressure.
 - What is the role of stoichiometric equation and stoichiometric coefficients in material balance of processes involving chemical reaction.

- Q10)** Solve any two of the following: [8]
- Calculate enthalpy change for the reaction at 25°C and producing 60 gmole of CO₂.

$$2C_4H_{10}(g) + 13O_2(g) \rightarrow 8CO_2(g) + 10H_2O(l).$$
 Given ΔH°_f Kcal/gmole C₄H₁₀(g) = -30.14, CO₂(g) = -94.05, H₂O(l) = -68.315.
 - An aqueous solution of sodium chloride is prepared by dissolving 25 gms of NaCl in 100 gms water. Find
 - Weight %
 - Mole %.
 - Composition. (at wt. of Na=23 and Cl =35.5)
 - A mixture of N₂ and CO₂ at 25°C and 1 atm. Pressure has average molecular weight of 31. What is the partial pressure of N₂?



P118

[3817]-33

F.Y. B.Sc. (Vocational)

INDUSTRIAL MICROBIOLOGY

Instrumentation and Material & Design

(New Pattern) (Paper - I) (Theory)

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate books.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) All questions carry equal marks.
- 5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 6) Assume suitable data, if necessary.
- 7) All questions are compulsory.

SECTION - I
Instrumentation

Q1) Do as directed

[10]

- a) Define the following terms:-
 - i) Precision.
 - ii) Standard operating procedures.
 - iii) Partition coefficient.
 - iv) Eh.
- b) State whether - True/False:-
 - i) Precision and accuracy refer to the same term when used in calibration of instruments.
 - ii) Colorimetry and spectrophotometry involve some similar principles.
 - iii) Paper chromatography involves both adsorption and partitioning.
- c) Choose the correct answer:-
 - i) When a weighing balance can measure differences of 0.5 mg, it can be said that its _____ is 0.5 mg.
 - a) Accuracy.
 - b) Sensitivity.
 - c) Max.measure difference.
 - d) Detection limit.

P.T.O.

- ii) Separation of amino acids using Whatman Filter Paper (Chr) No.1 involves the following:
 - a) Adsorption only.
 - b) Partitioning only.
 - c) Partitioning and Adsorption.
 - d) Distribution and partitioning.
- iii) Conductivity of a solution indicates its:
 - a) Ionicity.
 - b) pH.
 - c) Eh.
 - d) Colour.

Q2) Attempt any two of the following: **[10]**

- a) Describe the principle of gel filtration chromatography.
- b) Describe relationship between r.p.m. and r.c.f.
- c) Describe working of analytical centrifuge with Schlieren optical system.

Q3) Write short notes on (any four) **[10]**

- a) Dialysis.
- b) Use of Hydroxyapatite in chromatography.
- c) Turbidometry.
- d) Applications of infra-red spectroscopy.
- e) Beer and Lambert's law.

Q4) Enlist different types of centrifuges and describe in details working of any one. **[10]**

OR

Describe the principle underlying high pressure liquid chromatography (HPLC) and gas liquid chromatography (GLC). What are the advantages of HPLC over GLC?

SECTION - II
Material & Design

- Q5)** Do as directed: **[10]**
- a) Define the following terms:-
- i) Metal toxicity determination using agar diffusion technique.
 - ii) Biofouling.
 - iii) Chemical definition of glass.
 - iv) Microbial leaching.
 - v) Section line.
 - vi) Latex curing.
 - vii) Third angle projection.
- b) State whether-True/False:-
- i) PTFE is a non-thermostable polymer.
 - ii) Stainless steel 306 is not used in fabrication of fermenter vessels principles.
- c) Choose the correct answer:-
Polycarbonate is a:
- i) Metallic alloy.
 - ii) Thermolabile plastic.
 - iii) Thermostable polymer.
 - iv) A non-metallic alloy.

- Q6)** Answer any two of the following: **[10]**
- a) Enlist properties of steel.
 - b) What is injection molding.
 - c) Describe chemical properties of glass.

- Q7)** Write short notes on (any four): **[10]**
- a) Metal toxicity.
 - b) Auto - CAD.
 - c) Different types of rubber.
 - d) Different types of valves.
 - e) Symbols used in hydraulic drawings.

- Q8)** Describe the properties of Teflon, and explain why it is an ideal material in biotechnological applications. **[10]**

OR

Describe the processing of air lift percolator in copper leaching.



P120

[3817]-35

F.Y. B.Sc.(Vocational)

SEED TECHNOLOGY

**Morphology, Seed Development, Testing for Cultivar
Genuineness and Plant Breeding for Crop Improvement
(Paper - I) (New Course)**

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

- 1) *All questions are compulsory..*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat labelled diagrams wherever necessary.*

Q1) Attempt the following:

[16]

- a) What is microgametogenesis?
- b) Define allogamy.
- c) What is polyembryony?
- d) What is a Fruit?
- e) Define Dus System.
- f) What do you mean by artificial Vegetative propagation?
- g) Define a clone.
- h) What is heterosis?

Q2) Attempt any four of the following:

[16]

- a) Sketch and label the parts of a typical flower.
- b) Give the distinguishing characters of Family Asteraceae.
- c) What are the criterias used for harvesting of Fruits & Seeds?
- d) Define mutation. Explain different kinds of mutagens employed for induction of mutation.
- e) What is Pureline selection? Give the advantages of Pure line selection.
- f) Explain any one method of breeding for disease resistance.

P.T.O.

- Q3) Write notes on (any four) [16]**
- Structure of ovule in angiosperms.
 - Double Fertilization in angiosperms.
 - Mass selection.
 - Double cross hybrids.
 - Natural vegetative propagation.
 - Merits and demerits of Introduction.

- Q4) Attempt any two of the following: [16]**
- Describe the structure of seed with suitable diagram. Give the difference between seed and grain.
 - Explain the role of electrophoresis and grow out test in establishing cultivar genuineness.
 - State the Law of independent assortment. Explain it with a suitable example.
 - What are the characters of a clone? Give the advantages and limitations of clonal selection.

- Q5) Define Pollination. Give the contrivances, advantages and disadvantages of autogamy. [16]**

OR

What is hybridization? Explain its technique in self pollinated crops.



P121

[3817]-36

F.Y. B.Sc. (Vocational)

INDUSTRIAL CHEMISTRY - II

(New-2008 Pattern) (Paper - II)

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *All questions carry equal marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *All questions are compulsory.*

SECTION - I

Q1) Answer the following: [8]

- a) List two advantages of a solid fuel.
- b) Give any two uses of kerosene.
- c) What is the purpose of adding mercaptans to LPG?
- d) Name the pollutants emitted through the vehicle exhausts.

Q2) Attempt any two of the following: [8]

- a) Explain the fractional distillation of rock oil.
- b) Describe the synthesis of bio-gas.
- c) Write a short note on calorific value of coals.

Q3) Attempt any two of the following: [8]

- a) Explain what is meant by octane number. What are the methods that are used for increasing the octane number.
- b) Define the following:
 - i) Ignition temperature.
 - ii) Flame temperature.
 - iii) Flash point.
 - iv) Fire point.
- c) Describe in brief the properties and uses of coke.

P.T.O.

- Q4)** Answer any one of the following: [8]
- What is meant by proximate analysis of coal? Explain the process of analysis of different components of coal.
 - Give the classification of gaseous fuels and the process for synthesis of producer gas.

- Q5)** Answer any one of the following: [8]
- Describe the origin and the sources of petroleum.
 - What is coal tar? Give one process for its synthesis and name the fractions obtained from it.

SECTION - II

- Q6)** Answer the following: [8]
- What is meant by leaching of ores?
 - Define metallurgy and give its divisions.
 - Give two applications of zeolites.
 - Define calcination. Give one example.

- Q7)** Attempt any two of the following: [8]
- What are the different forms of silica? Explain their stability at different temperatures.
 - What is meant by concentration of ores? Describe any one process of concentration of ores.
 - Write a short note on reduction and its importance in metallurgy.

- Q8)** Attempt any two of the following: [8]
- Differentiate between diamond and graphite giving appropriate structures.
 - What is a slag? Give the classification of silicate slags.
 - Write a short note on pyrometallurgy.

- Q9)** Answer any one of the following: [8]
- What is a furnace? Give the different types of furnaces used in metallurgy.
 - What is activated charcoal? Give its applications.

- Q10)** Answer any one of the following: [8]
- Describe the interactions between sulphide and oxide of the same metal in extractive metallurgy.
 - Give the thermodynamics of roasting.



P122

[3817] - 39

F.Y. B.Sc. (Vocational)

ELECTRONIC EQUIPMENT AND MAINTENANCE

Maintenance Concepts and Assembly Methods

(Paper - II) (New)

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams wherever necessary.*

Q1) Attempt the following: **[16]**

- a) Explain the factors on which MTBF depends.
- b) Enlist the factors on which the resistance of a resistor depends.
- c) Inductor is a wattless component comment.
- d) Explain the factors on which capacitance of a capacitor depends.
- e) Explain the factors on which inductance of coil depends.
- f) Explain the applications of resistors.
- g) Explain the significance of Tolerance of resistors.
- h) Explain in short reactance of a capacitor.

Q2) Attempt any four: **[16]**

- a) Explain the advantages of ultrasonic techniques.
- b) Explain different losses in a transformer.
- c) What is Earthing? How it is done?
- d) Explain different types of transformer.
- e) Explain the importance of data sheets.

Q3) Attempt any four: **[16]**

- a) Explain the difference between good solder joint and bad solder joint.
- b) Name various types of capacitor used on the basis of the material used.
- c) Write a short note on different soldering techniques.
- d) What precautions should be taken during soldering and desoldering.
- e) "For instrument standardisation is necessary". Comment.

P.T.O.

Q4) Attempt any two of the following:- **[16]**

- a) Explain Electric shock? What precautions should be taken to avoid Electric shock.
- b) Explain causes & remedies of dry solder & cold solder.
- c) Draw the diagram of a typical stair case wiring & Explain.

Q5) Attempt any two of the following: **[16]**

- a) Explain the working of a M.C.B. also explain over load and short circuit test.
- b) Draw the diagram of a typical tube light wiring and explain.
- c) With the help of a neat diagram explain the connection of Bread Board.



P126**[3817]-101****S.Y. B.Sc. (Semester - I)****MATHEMATICS****Calculus of Several Variables****(Paper - I) (2008 Pattern) (51111)***Time : 2 Hours]**[Max. Marks : 40**Instructions to the candidates:*

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Answer the following questions :**[10]**

- a) Examine whether the following limit exists.

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 y^4}{(x^2 + y^4)^2}$$

- b) Find $\frac{\partial u}{\partial x}$ using definition, where $u(x, y) = ax^2 + 2bxy + cy^2$

- c) State whether the function $f(x, y) = \frac{x+y}{\sqrt{x} + \sqrt{y}}$ is homogeneous. If so, find its' degree.

- d) If $z = x^2 + y^2$, $x = \sin(u - v)$, $y = uv$ find $\frac{\partial z}{\partial u}$.

- e) State Taylor's theorem for a function of two variables.

- f) Find the stationary points of $f(x, y) = xy + \frac{1}{x} + \frac{1}{y}$.

- g) If $u = \log(x - 2y)$, find $\frac{\partial^2 u}{\partial y \partial x}$ at $(1, -1)$.

- h) Evaluate $\int \int_R r^3 \cos \theta dr d\theta$ where R is the region $1 \leq r \leq 2$, $\frac{\pi}{4} \leq \theta \leq \pi$.

- i) Evaluate $\int_{x=0}^2 \int_{y=0}^6 \int_{z=0}^{4-x} dx dy dz$.

j) If $x + y = u, x - y = v$, evaluate $J = \frac{\partial(x, y)}{\partial(u, v)}$.

Q2) Answer any two of the following : **[10]**

a) If $f(x, y)$ is continuous at (a, b) then prove that $f(x, b)$ is a continuous function of x at $x = a$ and $f(a, y)$ is a continuous function of y at $y = b$.

b) Change the order of integration and then evaluate $\int_0^{\infty} \int_x^{\infty} \frac{e^{-y}}{y} dy dx$

c) Find extreme values of the function $3x^2(y - 1) + y^2(y - 3) + 1$. Classify any one of them for extremum.

Q3) Answer any two of the following : **[10]**

a) State and prove Euler's theorem for homogeneous functions.

b) If $f(x, y) = \frac{x^3 y}{x^2 + y^2}, x^2 + y^2 \neq 0$
 $= 0, (x, y) = (0, 0)$

Find f_{yx} at $(0, 0)$.

c) If $w = \tan^{-1} \frac{x}{y}$ where $x = u + v, y = u - v$ verify that $\frac{\partial w}{\partial u} + \frac{\partial w}{\partial v} = \frac{u - v}{u^2 + v^2}$.

Q4) Attempt any one of the following : **[10]**

a) i) Find the area of the region included between the parabola $y = \frac{3}{4}x^2$ and the line $3x - 2y + 12 = 0$.

ii) Evaluate $\int_0^2 \int_0^x \int_0^{x+y} e^{x+y+z} dx dy dz$

b) Expand $f(x, y) = x^3 + y^3 + xy^2$ in powers of $(x - 1)$ and $(y - 2)$ by using Taylor's theorem.

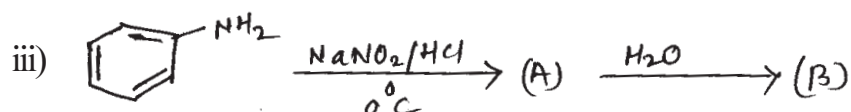
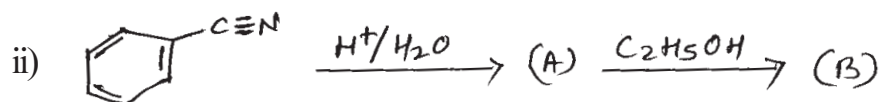
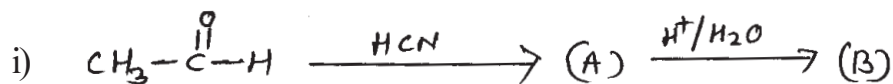


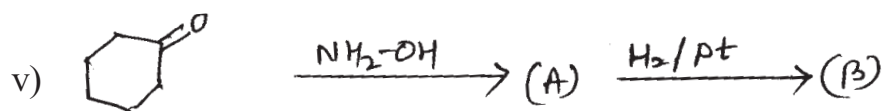
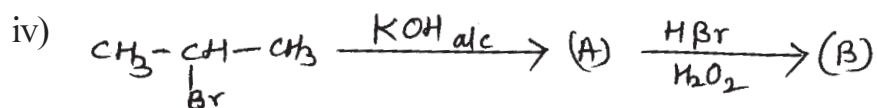
P131**[3817]-106****S.Y. B.Sc. (Semester - I)****CHEMISTRY****CH-212 : Organic Chemistry****(Paper - II) (2008 Pattern) (51321)***Time : 2 Hours]**[Max. Marks : 40**Instructions to the candidates:*

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw structures and diagrams if necessary.

Q1) Answer the following :**[10]**

- a) Define the term 'Angle strain'.
- b) How will you prepare Acetophenone from benzene?
- c) What is action of Br_2/NaOH on acetamide?
- d) Lower amines are water soluble while higher amines are water insoluble. Explain.
- e) What is action of raney nickel on thiophene?
- f) Draw the structure of 'Maltose'.
- g) What are fats and oils?
- h) Define peptide linkage.
- i) What is replication of DNA?
- j) Explain the role of Biochemistry in nutrition.

Q2) a) Assign the structure to (A) and (B) in the following reactions. (any three)[6]



b) How will you bring about the following conversions? (any two) [4]

- i) Ethyl bromide into propanoic acid.
- ii) Benzene into Acetanilide.
- iii) Isopropyl alcohol into chloroform.

Q3) Attempt any two of the following : [10]

- a) Give Haworth synthesis of Naphthalene. What is action of the following reagents on pyridine?
 - i) $\text{Br}_2/350^\circ\text{C}$.
 - ii) $\text{H}_2/\text{Pt } 25^\circ\text{C}$.
 - iii) $\text{KNO}_3/\text{H}_2\text{SO}_4, 300^\circ\text{C}$.
- b) What are enzymes? Explain the effect of the following on rate of enzyme catalysed reaction.
 - i) pH.
 - ii) Temperature.
 - iii) Substrate concentration.
- c) What are Nucleic Acids? Give importance of nucleic acids. Why specific pairing takes place between A and T and G and C only?

Q4) a) Attempt any two of the following : [6]

- i) What are disaccharides? Draw structures of sucrose. Why sucrose is nonreducing sugar?
 - ii) What are sphingolipids? Write the structures of :
 - 1) Cerebroside.
 - 2) Vitamin A
 - iii) Write a short Cannizzaro' reaction.
- b) Answer the following questions: [4]
- i) What are acid chlorides? How will you prepare acetyl chloride from acetic acid?
 - ii) Discuss the Sandmeyer reaction with suitable example.

OR

- c) Write a note on 'Baeyer Strain theory'.



P132

[3817] - 107

S.Y. B.Sc. (Sem. - I)

BOTANY

BO - 211 : Fundamentals of Plant Systematics and Plant Ecology

(2008 Pattern) (Paper-I) (51411)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Neat diagrams must be drawn wherever necessary.*

Q1) Attempt the following:

[10]

- a) Give any two objectives of taxonomy.
- b) Mention any two merits of Bentham and Hooker's system of plant classification.
- c) Enlist any two morphological features used in plant systematics.
- d) What is Binomial Nomenclature?
- e) Give Botanical names of any two plants of family myrtaceae.
- f) Mention the branches of ecology.
- g) Define population.
- h) Give any two external adaptive features of hydrophytes.
- i) Write any two causes of ecological succession.
- j) Give the names of any two ecological pyramids.

P.T.O.

Q2) Attempt any two of the following: **[10]**

- a) Give applications of phytochemistry in plant systematics.
- b) Describe migration stage of ecological succession.
- c) Give internal adaptive features of xerophytes.

Q3) Write short notes on any two of the following: **[10]**

- a) Rule of priority.
- b) Monograph.
- c) Ecology in disaster management.

Q4) What is a biogeochemical cycle? Describe water cycle. **[10]**

OR

Give distinguishing characters, floral formula and floral diagram of family Solanaceae and Meliaceae.



P133

[3817] - 108

S.Y. B.Sc. (Sem. - I)

BOTANY

BO - 212 : Fundamentals of Plant Physiology

(Paper-II) (51421) (2008 Pattern)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat labelled diagrams wherever necessary.*

Q1) Attempt the following:

[10]

- a) Define imbibition.
- b) Enlist two theories of water absorption.
- c) Mention any two deficiency symptoms of nitrogen.
- d) Name any two instruments for measurement of growth.
- e) Define water holding capacity.
- f) Define ascent of sap.
- g) What are growth regulators?
- h) What is vernalisation?
- i) Define salt absorption.
- j) Write any two applications of plant physiology.

P.T.O.

Q2) Attempt any two of the following: [10]

- a) Explain the practical applications of Auxins.
- b) What is photoperiodism? Classify the plants according to photoperiod.
- c) Explain the uptake of salts with the help of Donnan equilibrium.

Q3) Write notes on any two of the following: [10]

- a) Diffusion and osmosis.
- b) Role and deficiency symptoms of phosphorus.
- c) Phases of growth.

Q4) Explain the transpiration pull or cohesion tension theory of ascent of sap and add a note on various factors affecting ascent of sap. [10]

OR

Explain mechanism of opening and closing of stomata and describe K^+ pump hypothesis.



P134

[3817] - 109

S.Y. B.Sc.

ZOOLOGY

**ZY - 211 : General Zoology and Biological Techniques-I
(Paper-I) (Semester-I) (2008 Pattern) (51511)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Neat diagrams must be drawn wherever necessary.*

Q1) Attempt the following:

[10]

- a) Define alecithal egg.
- b) Name any one organism showing flagellar movement.
- c) State Lambert's law.
- d) Mention the name of mollusc with tubular shell.
- e) Name any one organism showing coeloblastula.
- f) What is test tube baby?
- g) Mention the name of instrument used to measure the blood pressure.
- h) Write any two functions of pedicellariae.
- i) State any one significance of fertilization.
- j) Enlist any two methods of sterilization.

P.T.O.

- Q2)** Write short notes on (any two): **[10]**
- a) Metamerism and its significance.
 - b) Paper electrophoresis.
 - c) Describe the process of dehydration with its significance.

- Q3)** Attempt the following (any two): **[10]**
- a) Describe piercing & sucking type of mouthparts.
 - b) Explain useful Protista.
 - c) Sketch & label - Ascending paper chromatography.

- Q4)** Describe digestive system and mode of feeding in starfish. **[10]**

OR

What is gastrulation? Give an account of the process of gastrulation.



Total No. of Questions : 4]

[Total No. of Pages : 2

P135

[3817] - 110

S.Y. B.Sc. (Sem. - I)

ZOOLOGY

ZY - 212 : Applied Zoology-I

(Fisheries and Agricultural Pests and their Control)

(Paper-II) (2008 Pattern) (51521)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Neat labelled diagrams must be drawn wherever necessary.*

Q1) Attempt the following:

[10]

- a) Mention the habit & habitat of mrigal.
- b) Write the biological name of mango stem borer.
- c) What is canning?
- d) Mention the biological name of lobster.
- e) Define resistance to a pesticide.
- f) What is gear?
- g) Write any one damage caused by pulse beetle.
- h) What is eustuarine fisheries?
- i) Define pest.
- j) Mention any two household pests.

P.T.O.

Q2) Write short notes on (any two): **[10]**

- a) Gill net.
- b) Marine fisheries.
- c) Birds as non insect pests.

Q3) Attempt the following: (any two) **[10]**

- a) Explain rotary duster.
- b) Write in brief nature of damage and control measures of Jowar stem borer.
- c) Describe any two fishery byproducts.

Q4) What is insecticide? Give a detailed account of stomach poisons and systemic poisons with suitable examples. **[10]**

OR

Describe the habit, habitat and cultural methods of Labeo rohita and Catla Catla.



Total No. of Questions : 4]

[Total No. of Pages : 2

P136

[3817] - 111

S.Y. B.Sc. (Sem. - I)

GEOLOGY

GL - 211 : Mineralogy

(51611) (2008 Pattern)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Neat diagrams must be drawn wherever necessary.*

Q1) Answer the following questions in two or three lines.

[10]

- a) What are non-crystalline minerals?
- b) Define hemihedral form.
- c) What is tetrahedron?
- d) Durability of gemstone means what?
- e) Define the term transparency.
- f) What is oblique extinction?
- g) Give the silicate structure of mica mineral group.
- h) Define sorosilicate structure.
- i) Give the alteration products of chlorite.
- j) What is the name and composition of orthorhombic amphibole?

P.T.O.

Q2) Write notes on (any two): **[10]**

- a) Classification of minerals based on silicate structure.
- b) Gem varieties of corundum.
- c) Classification of twins.

Q3) Explain the following: (any two) **[10]**

- a) Silicate structure and composition of olivine minerals.
- b) Compare elements of symmetry of Hexagonal system type calcite, quartz and tourmaline.
- c) Physical and optical properties and paragenesis of orthopyroxenes.

Q4) Define isotropic and anisotropic minerals. Describe in detail, the phenomenon of anisotropism with the help of passage of light through minerals. **[10]**

OR

Describe the structure, mineral composition, physical and optical properties and paragenesis of feldspar group of minerals.



P137

[3817] - 112

S.Y. B.Sc. (Sem. - I)

GEOLOGY

GL - 212 : Structural Geology

(2008 Pattern) (51621)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Neat diagrams must be drawn wherever necessary.*

Q1) Answer the following in 2 or 3 lines:

[10]

- a) What are planar structures?
- b) What are outliers?
- c) Define Rake of a linear feature.
- d) Draw the diagram of Box fold.
- e) What is recumbent fold.
- f) Define 'hade' of a fault.
- g) Define 'dip slip' along a fault.
- h) Define separation along fault.
- i) What are strike joints.
- j) Define an unconformity.

P.T.O.

Q2) Write notes on (any two): **[10]**

- a) Symmetrical and Asymmetrical folds.
- b) Normal and Reverse faults.
- c) Extension and Release joints.

Q3) Explain the following: (any two) **[10]**

- a) Determination of top of the bed with the help of ripple marks.
- b) Disconformity and Nonconformity.
- c) Parallel faults and Enechelon faults.

Q4) What are faults? Describe with suitable examples the effect of faulting on disrupted strata. **[10]**

OR

What are folds? Describe the various terms associated with fold. Add a note on plunging and Non-plunging folds.



P138

**[3817]-113
S.Y. B.Sc.
STATISTICS**

**ST - 211 : Discrete Probability Distributions and Time Series
(Paper - I) (2008 Pattern) (Sem. - I)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator and statistical tables is allowed.*
- 4) *Symbols and abbreviations have their usual meanings.*

Q1) Attempt each of the following :

[1 each]

- a) Choose the correct alternative in each of the following :
 - i) The fourth central moment (μ_4) in terms of cumulants is given by
 - A) k_4
 - B) $k_4 - 3k_2^2$
 - C) $k_4 + 3k_2^2$
 - D) $k_4 - 3k_3^2$
 - ii) If a.r.v $X \rightarrow$ Poisson (m), then its M.G.F. is
 - A) $e^{(me^+ - 1)}$
 - B) $e^{m(e^+ - 1)}$
 - C) $e^{m(e^+ + 1)}$
 - D) $e^{m(+ - 1)}$
 - iii) If $X \rightarrow$ Geometric (p) taking values 1, 2, 3,, then
 - A) Mean $>$ variance
 - B) Mean $<$ variance
 - C) Mean = variance
 - D) Mean = 2 variance
 - iv) Linear trend means
 - A) No change
 - B) Constant change
 - C) Changes are in geometric progression
 - D) None of these.

P.T.O.

- b) Fill in the blanks and complete the following statements : **[1 each]**
- i) If (X, Y) is a bivariate discrete r.v., where X and Y are independent, then $P_1(X | Y = y)$ is
 - ii) The recurrence relation between the probabilities of NB (k, p) is
 - iii) When the components in a time series are interactive model is suitable.
- c) State the characteristic property of geometric distribution. **[1]**
- d) State the components of a time series. **[1]**
- e) Describe the following service disciplines.
- i) FIFO
 - ii) LIFO **[1]**

Q2) Attempt any two of the following : **[5 each]**

- a) Suppose a r.v. X takes values $x_k = \frac{(-1)k_2^k}{k}$ with probability $P_k = 2^{-k}$ for $K = 1, 2, 3, \dots$. Does $E(X)$ exist? Give full justification.
- b) If a r.v. $X \rightarrow p(m)$ and r is any positive integer, then prove that
- $$\mu_{r+1} = m \left[r \mu_{r-1} + \frac{d\mu_r}{dm} \right]$$
- c) Customers arrive at a certain petrol pump in a poisson process with an average of 6 minutes between arrivals. The time interval between services at the petrol pump follow exponential distribution and the mean service time is 3 minutes per customer
- i) Find the probability that the pump is idle.
 - ii) What would be the expected queue length?
 - iii) What would be average waiting time in the queue?

Q3) Attempt any two of the following : **[5 each]**

- a) If (X, Y) is a bivariate r.v. with joint p.m.f.

$$P(x, y) = \frac{e^{-1} p^y q^{x-y}}{y!(x-y)!}, \quad \begin{matrix} x=0,1,2,\dots \\ y=0,1,2,\dots, x \\ 0 < p < 1 \quad q=1-p \end{matrix}$$

find the conditional distribution of Y given $X = x$. Also find $E[Y/X = x]$.

- b) State and prove the relationship between geometric distribution and negative binomial distribution.
- c) Write a short note on utility of time series analysis.

Q4) Attempt any one of the following :

- a) i) If a r.v. $X \rightarrow N. B. (k, p)$, find its mean and variance. [8]
- ii) State the different methods for estimating seasonal component of a time series. [2]
- b) i) With the usual notations prove that [8]

$$\mu'_1 = \sum_{j=1}^r {}^{r-1} C_{j-1} \mu'_{r-j} k_j$$

- ii) State any two real life situations where geometric distribution is applicable. [2]



P139

[3817]-114
S.Y. B.Sc.
STATISTICS

ST - 212 : Continuous Probability Distributions - I
(2008 Pattern) (Paper - II) (Sem. - I)

*Time : 2 Hours]**[Max. Marks : 40**Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator and statistical tables is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

Q1) Attempt each of the following :a) Choose the correct alternative in each of the following : **[1 each]**

i) If a continuous r.v. X has p.d.f.

$$f(x) = \frac{k}{1+x^2}, -\infty < x < \infty$$

then k is equal to

- A) π B) $\frac{1}{\pi}$ C) $\frac{\pi}{2}$ D) $\frac{\pi}{4}$

ii) If m.g.f. of a r.v. X is $M_X(t) = e^{2t+8t^2}$ then the third central moment of X is equal to

- A) 0 B) 2 C) 8 D) 32

iii) If $X \rightarrow \text{Exp}(2)$ then $P(X > 3)$ is equal to

- A) $e^{-\frac{3}{2}}$ B) $1 - e^{-\frac{3}{2}}$ C) e^{-6} D) $1 - e^{-6}$

b) State whether the given statement is true or false in each of the following:

[1 each]

- i) A continuous r.v. X takes on any specific value x with probability zero.
- ii) If $X \rightarrow U(-4, 4)$ then $\text{Var}(X) = 64$.
- iii) If X is a standard normal variate then $Y = 2X^2$ has $G(1, \frac{1}{2})$ distribution.

P.T.O.

- c) Define harmonic mean of a continuous r.v. X. [1]
- d) Define distribution function of a continuous bivariate r.v. (X, Y). [1]
- e) If a r.v. X has m.g.f. $M_X(t)$, state m.g.f. of $Y = 3X - 4$. [1]
- f) If X and Y are independent N (0, 2) and N (0, 3) variates respectively, state the distribution of $Z = 2X - Y$. [1]

Q2) Attempt any two of the following : [5 each]

- a) A continuous r.v. X has p.d.f.

$$f(x) = \frac{1}{2\sqrt{x}}, \quad 0 \leq x \leq 1$$

$$= 0, \quad \text{otherwise}$$

find mean, median and mode of X.

- b) Let X and Y be two continuous random variables having joint p.d.f.

$$f(x, y) = c(x^2 + y^2); \quad 0 \leq x \leq 1, \quad 0 \leq y \leq 1$$

$$= 0 \quad ; \text{ otherwise.}$$

Determine :

- i) the constant c ,
- ii) $P\left(X < \frac{1}{2}, Y > \frac{1}{2}\right)$
- c) The joint p.d.f. of (X, Y) is
- $$f(x, y) = e^{-(x+y)}; \quad x > 0, y > 0$$
- $$= 0 \quad ; \text{ otherwise}$$

show that $Z = X + Y$ and $W = \frac{X}{X + Y}$ are independently distributed.

Q3) Attempt any two of the following : [5 each]

- a) If $f(x) = ke^{-(9x^2 - 12x + 13)}$; $-\infty < x < \infty$, $k > 0$ is p.d.f. of a normal distribution, find the mean and standard deviation of the distribution.
- b) Find cumulant generating function of exponential distribution with parameter α . Hence, find coefficient of skewness γ_1 of the distribution.
- c) Find mode of gamma distribution with parameters α and λ , $\lambda > 1$.

Q4) Attempt any one of the following :

a) i) A continuous r.v. X has p.d.f.

$$f(x) = \frac{1}{x^2}, x \geq 1$$
$$= 0, \text{ otherwise}$$

find the p.d.f. of $Y = e^{-X}$. [3]

ii) If $X \rightarrow N(10, 4^2)$, find C such that $P(12 \leq X \leq C) = 0.2$ [3]

iii) If X_1, X_2, \dots, X_n are i.i.d. exponential variates with parameter

α , obtain the probability distribution of $z = \frac{1}{n} \sum_{i=1}^n X_i$. [4]

b) i) The p.d.f. of a continuous r.v. X is

$$f(x) = \frac{1}{4} (x - 1)^3, 1 \leq x \leq 3$$
$$= 0, \text{ otherwise}$$

obtain the distribution function of X. [3]

ii) Let $X \rightarrow U(0, 1)$. Find m.g.f. of X and hence find its mean. [3]

iii) The joint p.d.f. of (X, Y) is

$$f(x, y) = 3(x + y); 0 < x, y < 1, 0 < x + y < 1$$
$$= 0; \text{ otherwise.}$$

Find conditional p.d.f. of Y given $X = x$. [4]



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S.Y. B.Sc.

STATISTICAL TECHNIQUES

STT-211 : Statistical Techniques - I

(2008 Pattern) (Semester - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculator and statistical tables is allowed.*
- 4) *Symbols and abbreviations have their usual meaning.*

Q1) Attempt each of the following :

- a) Choose the correct alternative in each of the following : **[1 each]**
- i) For a geometric distribution with parameter p
 - A) mean = variance.
 - B) mean > variance
 - C) mean < variance.
 - D) none of the above.
 - ii) Let X follow exponential distribution with parameter 2 then the mean of X is
 - A) 2
 - B) $\frac{1}{2}$
 - C) 4
 - D) $\frac{1}{4}$
 - iii) Let $X \rightarrow N(\mu, \sigma^2)$. Then it is symmetric about
 - A) 0
 - B) 1
 - C) σ
 - D) μ
- b) State whether the given statement is true or false in each of the following: **[1 each]**
- i) The order of partial regression coefficient $b_{12.3}$ is 2.
 - ii) Geometric distribution is continuous probability distribution.
 - iii) The distribution function of exponential distribution with parameter α is $1 - e^{-\alpha x}$.

- c) If $X \rightarrow N(4, 4)$ then find the distribution of $Y = \frac{X-2}{2}$. [1]
- d) Define partial correlation coefficient. [1]
- e) Give one real life situation where multinomial distribution is applicable. [1]
- f) If all total correlation coefficients in a set of three variables are equal to ρ , then find $R_{1,23}^2$. [1]

Q2) Attempt any two of the following : [5 each]

- a) Define geometric distribution. State its mean and variance. Give two real life situations where geometric distribution is applicable.
- b) State and prove lack of memory property of exponential distribution.
- c) The probability that a family prefers tea of brand A is 0.3. Find the probability that the tenth family in a survey is found to be fifth one, who prefer tea of brand A. Also find the expected number of families not preferring tea of brand A before the fifth one, who prefer tea of brand A.

Q3) Attempt any two of the following : [5 each]

- a) Define multiple correlation coefficient $R_{i,jk}$. State the properties of multiple correlation coefficient.
- b) The following is the probability density function (p.d.f.) of a normal distribution :

$$f(x) = ce^{-\frac{1}{18}(x^2 - 10x + 25)}, -\infty < x < \infty$$

Identify the parameters of the distribution. Also find the value of constant c.

- c) Define multinomial distribution for the three variables. State the marginal distribution of a single variable.

Q4) Attempt any one of the following :

- a) i) State clearly, under which conditions the binomial distribution is approximated to normal distribution. Also give two real life situations where normal distribution is applicable. [5]
- ii) State the additive property of negative binomial distribution. Establish the recurrence relation between the probabilities of negative binomial distribution. [5]

- b) i) State the equation of plane of regression of X_1 on X_2 and X_3 . Interpret partial regression coefficient $b_{12.3}$. Also state three normal equations of this regression equations. **[5]**
- ii) The weight of apples may be assumed to be normally distributed with mean 140 grams and standard deviation 25 grams.
- Find: I) The probability that an apple weighs between 100 and 150 grams.
- II) The probability that an apple weighs more than 155 grams. **[5]**



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S.Y. B.Sc.

DEFENCE AND STRATEGIC STUDIES

DS. NO-101 : International Relations & Foreign Policy

(2008 Pattern) (Sem. - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*

Q1) Answer in 2 or 4 sentences each:

[16]

- a) What do you mean by International Relations?
- b) Define "National Interest".
- c) State the meaning of "foreign policy".
- d) Write any two "subject matter" of international relations.
- e) Define "National Power".
- f) State any two approaches to the study of international relations.
- g) Write the basic function of "National Interest".
- h) State the meaning of international community.

Q2) Answer in 8 to 10 sentences each [Any Two] **[8]**

- a) Explain the “Nature of international Relations”.
- b) Write in brief the utility of idealist theory in the present context.
- c) Explain in brief the concept of national power.

Q3) Write short notes on [Any Two] **[8]**

- a) Concept of Foreign policy.
- b) Scope of international Relations.
- c) Geography as a determinant of foreign policy.

Q4) Answer in 16 to 20 sentences. (any one) **[8]**

- a) Explain any two basic tenets of Indias foreign policy.
- b) Explain the role of national power in international relations.



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[3817] - 126

S.Y. B.Sc. (Sem. - I)

DEFENCE & STRATEGIC STUDIES

DS. NO. -102 : Elements of National Security

(2008 Pattern)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*

Q1) Answer in 2 to 4 sentences.

[16]

- a) Define National security.
- b) What do you mean by strategic threat?
- c) Define Diplomacy.
- d) State the meaning of scientific Research.
- e) Explain the meaning of strategic planning.
- f) What do you mean by economic sustainability.
- g) Define Military power.
- h) State the meaning of 'Nation'.

Q2) Answer in 8 to 10 sentences (Any Two)

[8]

- a) Discuss relationship between Economy and defence preparedness.
- b) Explain objectives of India's defence policy.
- c) Describe role of 'Military Diplomacy'.

P.T.O.

Q3) Write short notes on (Any Two): **[8]**

- a) Nuclear Elements.
- b) Research and Development.
- c) Determinants of Defence policy.

Q4) Answer in 16 to 20 sentences (Any One). **[8]**

- a) Examine India's security challenges in 21st century.
- b) Write a note on India's defence planning.



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S.Y. B.Sc. (Sem. - I)

DEFENCE & STRATEGIC STUDIES

DS.No.103 : Geopolitics

(2008 Pattern)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*

Q1) Answer in 2 or 4 sentences each.

[16]

- a) Define geopolitics.
- b) What do you mean by strategic minerals?
- c) Define "State".
- d) State the meaning of "Maritime Boundaries".
- e) Define "Buffer state".
- f) State the factors of geopolitics.
- g) Write the names of energy production resources.
- h) State the uses of uranium.

Q2) Answer in 8 To 10 sentences each (Any Two)

[8]

- a) How the concept of strategic minerals came into existence?
- b) Explain how the territory would be factor of geopolitics?
- c) Write in brief the concept of land locked state.

P.T.O.

Q3) Write short notes on (Any Two): **[8]**

- a) OPEC & Politics of oil.
- b) Concept of exclusive economic zone.
- c) Difference between Frontiers and Boundaries.

Q4) Answer in 16 To 20 sentences (any one). **[8]**

- a) Explain the geostrategic position & importance of Andaman and Nicobar Islands.
- b) Highlight on basic elements for creation of state.



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S.Y. B.Sc. (Sem. - I)

ENVIRONMENTAL SCIENCES

ENV-201 : Ecology & Ecosystem

(Revised 2008 Pattern) (Paper-I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Draw neat and labelled diagram wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Attempt the following in 1-2 lines each.

[10]

- a) Define the term : Ecology.
- b) What is meant by limiting factor?
- c) State the difference between Natality & Mortality.
- d) What is Predation? Give one example.
- e) Name any 2 types of Terrestrial ecosystem.
- f) What is xerosere?
- g) What is Environmental heterogeneity?
- h) Enlist the types of food chain.
- i) Name any 2 micro organisms which fix atmospheric nitrogen.
- j) What is meant by Biotic potential?

P.T.O.

Q2) Write notes on any two of the following: [10]

- a) Historical overview of ecology.
- b) Phosphorus cycle with diagram.
- c) Productivity of an ecosystem.

Q3) Answer any two of the following: [10]

- a) Explain various stages of atmospheric evolution.
- b) Explain the zonation in marine ecosystem with diagram.
- c) Discuss the salient features of an estuarine ecosystem.

Q4) Answer any one of the following: [10]

- a) Explain with illustration the 'S' & 'J' shaped population growth curves.
- b) What is meant by ecosystem productivity? Explain it in detail.



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S.Y. B.Sc. (Sem. - I)

ENVIRONMENTAL SCIENCE

ENV-202 : Hydrology

(Revised 2008 Pattern) (Paper-II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Attempt the following in 1-2 lines each.

[10]

- a) Define watershed.
- b) Mention the Indian province suffering from Arsenic pollution.
- c) What is aquifer?
- d) Mention any legislation for water quality in India.
- e) Define hydrology.
- f) What is rain water harvesting.
- g) Write any two environmental problems associated with water pollution.
- h) Mention any two preventive measures for salt water intrusion.
- i) Differentiate river water with sea water.
- j) Write any two anthropogenic sources of groundwater pollution.

P.T.O.

Q2) Attempt any two of the following each in 8-10 lines. **[10]**

- a) Discuss the issues regarding rain water harvesting.
- b) Distinguish between primary & secondary aquifers.
- c) Mention the water quality criteria based on its uses.

Q3) Write notes on any two of the following each in 8-10 lines: **[10]**

- a) Traditional methods of water harvesting.
- b) Artificial recharge method.
- c) Non-renewable ground water resources.

Q4) Answer any one of the following each in 20-22 lines: **[10]**

- a) Explain the physical chemical & biological properties of ground water in terms of its quality.
- b) Discuss various types of origin of water with respect to chemical comp.



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S.Y. B.Sc.

OPTIONAL ENGLISH

Enriching Oral and Written Communication in English

(2008 Pattern) (Sem. - I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Attempt any one of the following. **[10]**

- a) What is communication and how is it important in our lives?
- b) Explain the importance of nonverbal communication at the time of interview.
- c) Imagine that you have just been appointed as a faculty in science. You have no experience of teaching and want to learn how to do your job well. Explain how horizontal communication can help you handle the situation.

Q2) Attempt the following.

- a) Find out the meaning of the underlined words in the given sentences. **[2]**
 - i) You look nice in the blue shirt.
 - ii) I have been feeling kind of blue.
- b) Write words closely related in meaning to the following words. **[2]**
 - i) wash ii) clever
- c) Use the following words in separate sentences. **[2]**
stationary, stationery.

P.T.O.

- d) Match the synonymes. [4]
- | A | B |
|-------------|----------|
| 1) irritate | purpose |
| 2) power | custom |
| 3) motive | capacity |
| 4) habit | annoy |

Q3) Attempt the following.

- a) Change the following words by adding prefixes. (any two) [2]
- i) usual ii) efficient iii) symmetry
- b) Change the following words by adding suffixes. (any two) [2]
- i) diagnose ii) office iii) relieve
- c) Make noun. (any two) [2]
- i) please ii) develop iii) global
- d) Write down the right combination of the following pairs. [4]
- i) high standard / great standard
- ii) press an icon / click on an icon
- iii) gossip writer / gossip columnist
- iv) make amends / do amends
- v) good intention / nice intention.

Q4) Attempt the following.

- a) Write four words belonging to the following lexical web. (any one) [1]
- i) weather ii) football
- b) Identify the part of speech of the underlined word. (any one) [1]
- i) He is a bright student.
- ii) She dances gracefully.
- c) Write the meaning of any one of the following phrase and use in the sentence. [1]
- i) pass over ii) bear out.

- d) Transcribe phonetically any one of the following and mark the accent. **[1]**
i) cabin ii) expel
- e) Say whether the following sentences will be said with a falling or a rising tone. **[1]**
i) Will you water the plant?
ii) We are late for office.
- f) Under line the weak forms in the following sentences. (any one) **[1]**
i) They are friends.
ii) Look at this.
- g) Write at least five responses to the situations given below. (any two) **[4]**
i) Asking for help.
ii) Encouraging.
iii) Responding to good news.



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S.Y. B.Sc. (Sem. - I)

ELECTRONIC EQUIPMENT MAINTENANCE

**Voc. EEM -211 : Audio, Video & Office Equipments-A
(2008 Pattern) (Paper-I) (Vocational) (58111)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Use of calculator / log table is allowed.*

Q1) Answer the following.

- a) State the function of preamplifier in tape recorder. [1]
- b) What is the maximum audio frequency transmitted by an AM station?[1]
- c) How the colour signal is recorded on tape? [1]
- d) State the types of display devices. [1]
- e) What are the different methods of erasing the tape? [2]
- f) Explain the difference between a mono and stereo system. [2]
- g) What are the constituents of composite video signal? [2]
- h) Explain the significance of scanning. [2]

P.T.O.

Q2) Answer any two.

- a) Draw a neat block diagram of an AM superhetrodyne receiver. Explain the function of a mixer. [4]
- b) Explain the recording mode of audio tape recorder. [4]
- c) Describe the MP3 player in brief. [4]

Q3) Answer any two.

- a) Describe the basic principle of video recording using rotory head. [4]
- b) Explain the working of VCD player with the help of neat block diagram. [4]
- c) Draw a neat diagram of PA system. Discuss the function of any one block. [4]

Q4) Answer the following:

- a) Describe a CCTV system used in typical office. Explain the advantages of such system. [6]
- b) Draw a block diagram of BW-TV receiver and explain only sound section. [6]

OR

- a) Discuss the recording and playback mechanism in ACD. [6]
- b) Explain various receiver characteristics of AM receiver. State the purpose of alignment of various stages. [6]



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S.Y. B.Sc. (Vocational)

INDUSTRIAL MICROBIOLOGY

VOC- IND-MIC-211 : Bioreactors-Design and Operation

(Semester-I) (2008 Pattern) (Paper-I)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) All questions carry equal marks.*
- 4) Draw neat labelled diagrams wherever necessary.*
- 5) Use of scientific calculators is allowed.*

Q1) Answer each sub-question in one or two lines; Fill in the blanks; State whether the statement is true or false. **[10]**

- a) State whether the following statement is TRUE or FALSE “The head space in a fermenter is approximately 20% of the total volume of the fermenter”.
- b) State whether the following statement is TRUE or FALSE “Foam formation helps in transfer of oxygen to the cells near the head space in the fermentation broth”.
- c) State whether the following statement is TRUE or FALSE “Baffles are always present on the walls of the fermenter”.
- d) State whether the following statement is TRUE or FALSE “Exit gas is the gas which is metabolically produced by the growing culture”.
- e) State the advantage of batch process as compared continuous process of fermentation.
- f) State the disadvantage of using Hollow Fibre Reactors for high viscosity fermentation broths.

P.T.O.

- g) State why heating / cooling jackets are not usually used in production scale fermenters.
- h) Name two types of spargers.
- i) Define the term “Commercial Sterility”.
- j) Define ‘dual fermentation’.

Q2) Answer **any two** of the following. **[10]**

- a) Draw a neat labeled diagram of a chemostat and explain its working.
- b) With the help of a diagram, explain the principle of operation of a sensor used for monitoring pH during a fermentation process. State the importance of monitoring pH.
- c) With the help of a diagram, explain the difference in flow patterns provided by a turbine impeller and a propeller impeller.

Q3) Answer any two of the following. **[10]**

- a) Diagrammatically represent the three methods used for immobilization of enzymes. Explain the covalent binding method and its application(s) in the fermentation industry.
- b) With the help of a diagram, explain the construction and functioning of forced draft cooling towers.
- c) Explain the advantages of a continuous process of fermentation over a batch process. Draw the profile for product formation during a batch process.

Q4) Answer any one of the following: **[10]**

- a) Explain why monitoring and control of a fermentation process is important. Explain the importance of a Time-Course of a batch process. Delineate the important parameters that need to be monitored for production of biomass.
- b) Draw a figure (to scale) of fermenter vessel, impellers and baffles for a CSTR with a working volume of 20,000 liters.



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S.Y. B.Sc. (Sem. - I)

INDUSTRIAL CHEMISTRY

VOC-212 : Inorganic Process Industries

(2008 Pattern) (Paper-IV) (Vocational)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagrams wherever necessary.*

Q1) Answer the following.

[16]

- a) Define Matrix phase.
- b) What are whiskers?
- c) What is caustic embrittlement?
- d) What is the vehicle used for paints?
- e) Explain the composition of two types of bronzes.
- f) Name two methods to prevent corrosion.
- g) What is fibre glass?
- h) Define: Cullet.

Q2) Attempt any two of the following.

[8]

- a) Discuss the composition of aluminium alloys.
- b) How are alloys classified?
- c) Explain the types of Pigments.

P.T.O.

Q3) Attempt any two of the following. **[8]**

- a) Explain the classification of refractory materials.
- b) Write a note on curing of cement.
- c) Explain annealing of glass.

Q4) Define corrosion. Give the mechanism of wet corrosion. **[8]**

OR

Describe the manufacture of glass by tank furnace process.



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S.Y. B.Sc. (Vocational)

ELECTRONIC EQUIPMENT MAINTENANCE (P-2)

**VOC-EEM-212 : Maintenance Concepts and Repair - II - A
(Semester-I) (58121) (2008 Pattern) (Paper-I)**

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Use of log table and calculator is allowed.*

Q1) Answer the following:

- a) What is the use of constant voltage transformer? [1]
- b) What do you mean by 'burn - in' in respect of monitor screen? [1]
- c) What is installation manual? What are its contents? [2]
- d) State the limitations of ISO certificate. [1]
- e) What do you mean by Quality and Quality Assurance? [2]
- f) Which fire extinguishers should not be used for electric fire? [2]
- g) Explain the term maintainability. [1]
- h) Mention the applications of Nickel - cadmium batteries. [2]

Q2) Answer **any two** of the following:

- a) Write a note on maintenance log book and explain its importance. [4]
- b) What are common faults in lead acid batteries. [4]
- c) Explain the types and causes of failure. [4]

P.T.O.

Q3) Answer **any two** of the following:

- a) State and explain different stages of maintenance. [4]
- b) Write a note on service manual. Indicate its importance. [4]
- c) What are the requirements for selecting a suitable site? What is to be done to prepare the site for successful installation? [4]

Q4) Answer the following:

- a) State and explain different types of equipments. [6]
- b) Write note on reliability of series and parallel system. [6]

OR

- a) Explain the importance of artificial earth. Name all the methods used for this purpose. Describe the pipe earth in detail with diagram. [6]
- b) List the precautions needed in installation of TV receiver. [6]



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S.Y. B.Sc. (Vocational)

INDUSTRIAL MICROBIOLOGY

VOC-IND-MIC-212 : Screening and Process Optimization

(Semester-I) (2008 Pattern) (Paper-II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) All questions carry equal marks.*
- 4) Draw neat labelled diagrams wherever necessary.*

Q1) Answer each sub-question in one or two lines; Fill in the blanks; State whether the statement is true or false. **[10]**

- a) State whether the following statement is TRUE or FALSE
“Antibiotics are considered as primary metabolites of bacteria”.
- b) State whether the following statement is TRUE or FALSE
“Precursors from medium end up as a part of the final product molecule”.
- c) State whether the following statement is TRUE or FALSE
“Giant colony technique is a secondary screening method”.
- d) Fill in the blank.
_____ method is widely used for preservation of sporulating bacteria.
- e) Fill in the blank.
Presence of _____ in the medium induces penicillin production by the organism.
- f) Define the term “buffers”.
- g) Define “Simpson’s Index”.
- h) Name any two medium ingredients which serve as source of carbon in a

P.T.O.

fermentation medium.

- i) State one advantage of targeted screening.
- j) Name any two exhaust gases produced during fermentation.

Q2) Answer any two of the following. [10]

- a) What are revertant mutants? Explain how they are useful in a fermentation process for the overproduction of metabolite.
- b) Give the objectives of scale-up.
- c) Define “unculturable bacteria”. Describe one cultivation approach for these types of bacteria.

Q3) Answer any two of the following. [10]

- a) Define “Screening”. Explain the process and objectives of primary screening.
- b) Justify, “inoculum build-up is an important step in a fermentation process”.
- c) Enlist the process parameters which need to be controlled during fermentation. Give the importance of temperature control.

Q4) Answer any one of the following: [10]

- a) Enlist methods used for preservation of industrially important microorganisms. Describe any four of them.
- b) Discuss in detail the methods of fermentation medium sterilization.



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F.Y.B.Sc.

CHEMISTRY - I

Physical and Inorganic Chemistry

(Paper - I) (2008 Pattern) (Theory) (New Course)

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw neat diagrams wherever necessary.
- 4) Use of logarithmic table/calculator is allowed.

Q1) Attempt the following.**[16]**

- a) Find x , if $10^x = 7.86$
- b) Explain Brownian movement of colloidal solution.
- c) Define coefficient of viscosity and give its unit.
- d) Explain the importance of Carnot cycle.
- e) What are the applications of Ni and Fe as catalyst.
- f) State type of hybridization and shape of following:
 - i) PCl_5 .
 - ii) IF_7 .
- g) Convert 2.5 gms of CaCO_3 in moles.
- h) What are the limitations of octet theory.

Q2) a) Attempt any four of the following.**[8]**

- i) Find the hydrogen ion concentration of the solution if its pH is 4.55.
- ii) Find the slope and intercept of the line having equation $(x + y + 4) = 8x - 7$.
- iii) Find the equation of a straight line passing through (2, -1) and has slope $m = -3$.
- iv) If $y = \frac{x^2 + 5}{x + 2}$ Find $\frac{dy}{dx}$.

P.T.O.

v) If $y = (x^2 + 8)(x^2 + 2)$ find $\frac{dy}{dx}$.

vi) $\int_{10}^{100} RT \frac{dv}{v} = ?$ (R and T are constant).

vii) Find the value of p if $\log_e 48 = P$.

viii) $\int (8x^3 + 7x^2 + 15) dx = ?$

b) Derive the reduced equation of state from vander Waal's equation. Give importance of reduced equation of state. [4]

c) Attempt any one of the following: [4]

i) Determine critical constants of a gas with vander waals parameters $a=0.751 \text{ atm. lit}^2 \text{ mol}^{-2}$ $b= 0.0226 \text{ lit. mol}^{-1}$.

Calculate P_c , V_c and T_c from the data.

ii) When 4 moles of an ideal gas is heated from 298 K to 498K, change in entropy at constant pressure is 12.5 eu. Calculate heat capacity at constant volume.

Q3) a) Attempt any three of the following. [12]

i) Derive an equation for the radius of n^{th} orbit on the basis of Bohr's Theory.

ii) Derive an expression for entropy change on mixing of ideal gases.

iii) Define surface tension. Explain the capillary method for determination of surface tension.

iv) What is enzyme catalysis? Explain its characteristics.

b) Attempt any one of the following. [4]

i) Calculate radius of K shell of hydrogen atom. Given:

$$h = 6.624 \times 10^{-27} \text{ erg.sec.}$$

$$m = 9.11 \times 10^{-28} \text{ gm.}$$

$$e = 4.80 \times 10^{-10} \text{ e.s.u.}$$

ii) Calculate the shortest and longest wavelength in hydrogen spectrum of Lyman series $R_H = 109678 \text{ cm}^{-1}$.

Q4) a) Attempt any three of the following. [12]

i) What is a colloid? Distinguish between Lyophilic and lyophobic colloids.

- ii) Explain the set of four quantum numbers.
 - iii) What is a catalyst? Explain general characteristics of catalytic reaction.
 - iv) Explain in detail the electro dialysis method for the purification of colloidal solution.
 - v) Derive an expression for radius of electron in Bohr's orbit.
- b) Attempt any one of the following: **[4]**
- i) Define 'Hydrogen bond' and explain the causes and conditions for the formation of hydrogen bond.
 - ii) What is dsp^2 -Hybridisation? Explain with suitable example.

Q5) a) Attempt any two of the following: **[6]**

- i) What are similarities of Hydrogen with Halogens and Alkali metals.
- ii) "Sigma bond is stronger than π -bond". Explain with suitable example.
- iii) How many moles are present in 0.3 gm of the following compound.
 - 1) H_2O .
 - 2) H_2SO_4

(Atomic weight of H=1, S=32, O=16).

b) Attempt any two of the following. **[10]**

- i) Give assumptions of VSEPR theory.
- ii) Explain the formation of F_2 and N_2 molecule on the basis of atomic orbital overlap.
- iii) 20 ml solution of the NaOH containing 3 gm of alkali per litre is exactly neutralized by 25 ml of a H_2SO_4 Solⁿ. and 35 ml of HCl solution separately. Calculate the strength of the acid in gms per litre.



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[3817] - 6

F.Y. B.Sc.

CHEMISTRY - II

Organic and Inorganic Chemistry

(New Course) (Paper - II) (2008 Pattern) (Theory)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions : **[16]**

- a) Explain-Benzene is aromatic compound.
- b) What is vital force theory? Why it is failed?
- c) Alcohols are water soluble but alkyl halides are water insoluble. Explain.
- d) Define the following terms.
 - i) Enantiomers
 - ii) Dextro rotatory compound
- e) Branched alkanes have lower b.p and m.p than corresponding straight chain alkanes. Explain.
- f) Write names and symbols of Group - IIA elements in S-block of periodic table.
- g) What is oxidation number of
 - i) P in NaHPO_2
 - ii) As in $(\text{AsO}_3)^{3-}$
- h) Draw the structures of the following
 - i) XeF_4
 - ii) XeO_3

Q2) a) Attempt any two of the following : **[8]**

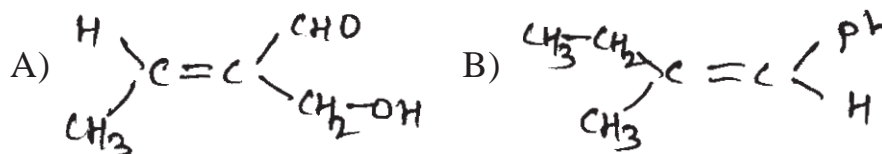
- i) What is mesomeric effect? Explain +R and -R effect with suitable examples.
- ii) What are phenols? What is the action of following reagents on Phenol.
 - A) Conc. HNO_3
 - B) Br_2/CCl_4
- iii) Discuss the conformational isomerism in propane with energy profile diagram.

P.T.O.

- b) Attempt any two of the following : [8]
- What are alcohols? How are they classified? Discuss any two methods for preparation of ethanol.
 - What are alkanes? How will you prepare n-butane from
 - 2-butene
 - Ethyl chloride
 - What are aromatic compounds? Discuss Huckel's rule of aromaticity with examples.

Q3) a) Answer any two of the following : [8]

- What is hybridisation? Discuss the formation of ethylene molecule using the concept of hybridisation.
- What are alkenes? How will you prepare ethene from
 - Ethyl bromide
 - Ethanol
- Assign E and Z configuration of following compounds

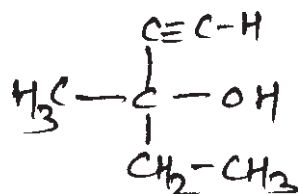


- What are ethers? How will you prepare dimethyl ether from
 - Methyl iodide
 - Diazomethane

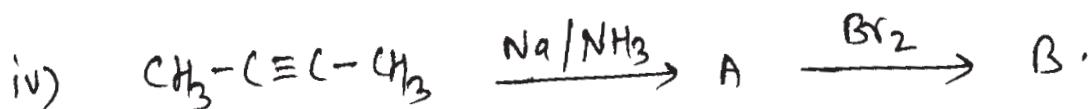
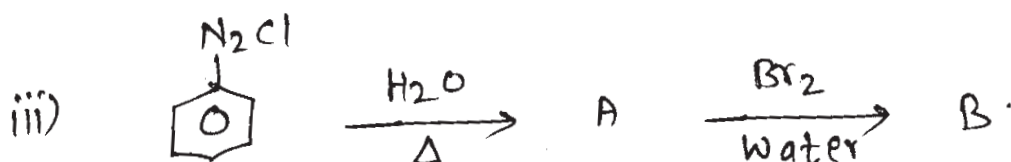
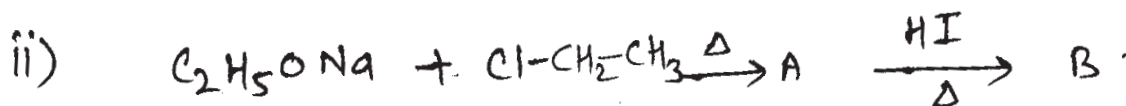
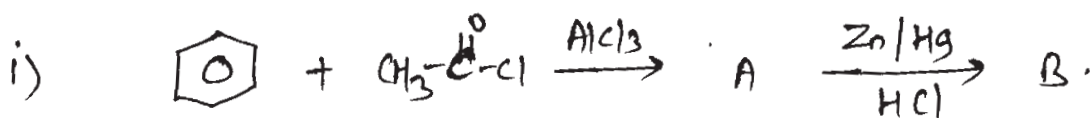
- b) Attempt any two of the following : [8]
- What is dehydrohalogenation reaction? How will you prepare propene and 2-butene by this reaction?
 - Write short notes on
 - Saytzeff rule
 - Anti-MarKovni Koff's rule
 - What are intermolecular and intramolecular forces present in the molecules? Explain.

Q4) a) Attempt any three of the following : [6]

- i) Draw all possible isomers of the compound having molecular formula C_2H_6O .
- ii) Define the following
 - A) Bond length
 - B) Dihedral angle
- iii) Draw the structures for the following compounds
 - A) 2-methoxy pentane.
 - B) 1-Bromo-2, 2-dimethyl propane.
- iv) Assign R or S configuration of following compound



b) Identify the products A and B and rewrite the reactions (Any two) [4]



c) Attempt any one of the following : [6]

- i) Define Periodicity. Discuss Periodicity in properties with respect to
 - A) Size of Atoms and ions
 - B) Ionisation Energy
 - C) Electron affinity
- ii) Explain the diagonal relationship between Beryllium and Aluminium.

- Q5) a) Attempt any two of the following : [6]**
- i) Calculate the screening constant 'S' hence Z^* for the valence electron of aluminium ($Z = 13$).
 - ii) Explain the rules for calculating the oxidation number.
 - iii) What are the chemical properties of the Noble gases?
- b) Attempt any two of the following : [10]**
- i) Discuss the bonding and shape of
A) XeF_6 B) XeO_4
 - ii) What are the application of alkaline earth metals & their compounds?
 - iii) State and explain different blocks of elements in periodic table.



Total No. of Questions : 5]

[Total No. of Pages : 2

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[3817] - 7

F.Y. B.Sc.

BOTANY

Plant Diversity

(Paper - I) (New Course) (41410)

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat labelled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt the following.

[16]

- a) What are biennials?
- b) What is isogamy?
- c) Define fungi.
- d) What are Bryophytes?
- e) Give any two characteristics of pteridophytes.
- f) What is pycnoxylic wood?
- g) Give any two characteristics of dicofyledons.
- h) Define ex-situ conservation.

Q2) Attempt any four of the following.

[16]

- a) Explain the diversity in habit of higher plants.
- b) Describe vegetative reproduction in Algae.
- c) Explain the structure of cell in eumycetes.
- d) Describe the structure of archegonium in Bryophytes.
- e) Give schematic representation of life cycle in pteridophyte with suitable example.
- f) Comment on need of conservation of plant diversity.

P.T.O.

Q3) Write short notes on any four of the following. [16]

- a) Cell structure in eukaryotic alga.
- b) Fruticose lichen.
- c) Siphonostele.
- d) Female cone in Gymnosperms.
- e) Nutrition in Angiosperms.
- f) Concept of conservation of plant diversity.

Q4) Attempt any two of the following. [16]

- a) Describe thallus diversity in Algae.
- b) Describe asexual reproduction in Fungi.
- c) Comment on affinities of Gymnosperms with Angiosperms.
- d) What is in-situ conservation? Describe any two methods of in-situ conservation of plant diversity.

Q5) Describe life cycle pattern in cystopus. Add a note on nutrition in Fungi. [16]

OR

Sketch, label and describe internal structure of dicot stem and root.



Total No. of Questions : 6]

[Total No. of Pages : 2

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[3817]-9

F.Y. B.Sc.

ZOOLOGY

Non-Chordates and Chordates

(New Course) (Paper - I) (2008 Pattern) (Theory) (41510)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

Non-Chordates

Q1) Define/Explain (any ten) : **[10]**

- a) Aquaculture.
- b) Species.
- c) Cytopyge.
- d) Medusae.
- e) Clitellum.
- f) Nacre.
- g) Autotomy.
- h) Trichocysts.
- i) Calcoblasts.
- j) Helminthiasis.
- k) Plantae.
- l) Conjugation.

Q2) Write short notes on (any three) : **[15]**

- a) Radial symmetry in cnidaria.
- b) General characters of mollusca.
- c) Contractile vacuoles in Paramecium.
- d) Entomology.
- e) Useful species of Earthworm for Vermiculture.

Q3) Attempt the following : **[15]**

- a) Mention the diagnostic features of protista.
- b) Explain the regeneration in planaria.
- c) Give the importance of coral reefs.

P.T.O.

OR

Mention the distinguishing characters and classification of phylum porifera. Give suitable examples and characters of any three classes.

SECTION - II

Chordates

Q4) Define/Explain (any ten) : **[10]**

- a) Vertebrata.
- b) Catadromous migration.
- c) Marsupial mammals.
- d) Floating posture.
- e) Camouflage.
- f) Brow spot.
- g) Nuptial pad.
- h) Homodont teeth.
- i) Agnatha.
- j) Anura.
- k) Cephalochordata.
- l) Granulocytes.

Q5) Write short notes on (any three) : **[15]**

- a) Spiny ant eater.
- b) Aquatic adaptation of reptiles.
- c) Cutaneous respiration in frog.
- d) Renal portal system of frog.
- e) Diversity of placental mammals in terrestrial habitat.

Q6) Attempt the following : **[15]**

- a) Give general characters of class Aves.
- b) Sketch and label male urinogenital system of frog.
- c) Mention the general organization of cyclostomata.

OR

Describe the digestive system of frog and add a note on food, feeding and physiology digestion.



Total No. of Questions : 6]

[Total No. of Pages : 3

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[3817]-10

F.Y. B.Sc.

ZOOLOGY

Genetics and Parasitology

(2008 Pattern) (Paper - II) (Theory)

(New Course) 41520

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

(Genetics)

Q1) Define/Explain the following (Any Ten)

[10]

- a) Genetics.
- b) Back Cross.
- c) Epistasis.
- d) Polyploidy.
- e) Rh Factor.
- f) Telomere.
- g) Law of segregation.
- h) Transgenic animals.
- i) Parthenogenesis.
- j) Polygenic inheritance.
- k) SAT-Chromosome.
- l) Kappa particles.

Q2) Write short notes on (Any Three)

[15]

- a) Klinefelter's syndrome.
- b) Gene therapy.
- c) Alkaptonuria.
- d) Lampbrush chromosome.
- e) Colourblindness.

P.T.O.

Q3) Attempt the following

[15]

- a) Explain the inheritance of inhibitory genes (13:3 ratio).
- b) What is sex determination? Explain XX – XY method of sex determination.
- c) What type of blood groups are possible in the offsprings of the following crosses with reference to ABO blood group system in man.
 - i) $I^A I^O \times I^A I^O$
 - ii) $I^A I^B \times I^O I^O$
 - iii) $I^B I^B \times I^O I^O$
 - iv) $I^B I^B \times I^A I^B$
 - v) $I^A I^A \times I^O I^O$

OR

Explain any three structural chromosomal aberrations with suitable examples.

SECTION - II

(Parasitology)

Q4) Define/Explain the following (Any Ten)

[10]

- a) Medical helminthology.
- b) Symbiosis.
- c) Vector.
- d) Metaplasia.
- e) Antibody.
- f) Redia larva.
- g) Filariasis.
- h) Scabies.
- i) Repair.
- j) Encystment.
- k) Parasite.
- l) Microfilaria larva.

Q5) Write short notes on (Any Three)

[15]

- a) Parasitic effects of Ascaris lumbricoides.
- b) Anthrax.
- c) Pathological effects of Fasciola hepatica.
- d) Control measures of Sarcoptes scabiei.
- e) Erythrocytic schizogony.

Q6) Attempt the following:

[15]

- a) What is host specificity? Explain ecological host specificity with suitable example.
- b) Explain any five subtypes of endoparasites with suitable example.
- c) Define host. Explain any two types of host with suitable example.

OR

Explain in detail life cycle of head louse. Add a note on its pathogenecity and control measures.

