

Total No. of Questions : 5]

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**[3618]-59**

**F. Y. B. Sc. (Computer Science) Examination - 2009**

**STATISTICS**

**PAPER - II**

**STATISTICAL METHODS - II**

**(2004 Pattern)**

**Time : 3 Hours]**

**[Max. Marks : 80**

**Instructions :**

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

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**Q.1) Attempt each of the following :**

**[8x2=16]**

- (a) Find 'n' if  ${}^n P_2 = 132$ .
- (b) State classical definition of probability of an event.
- (c) Consider the following probability distribution of X :

X	1	2	3	4	5
P[X = x]	2k	5k	6k	k	k

Find :

- (i) The value of k,
- (ii) The distribution function of X.
- (d) Define conditional probability of an event.

- (e) An unbiased coin is tossed six times. What is the probability of getting at most one head ?
- (f) State Bayes' Theorem.
- (g) A random variable  $X$  has an exponential distribution with mean 10. Find  $P[X > 8 / X > 4]$ .
- (h) Define each of the following :  
Critical Region, Type I Error

**Q.2)** Attempt **any four** of the following :

**[4x4=16]**

- (a) State and prove addition theorem of probability for any two events  $A$  and  $B$  defined on a sample space.
- (b) One card is selected at random from 50 cards numbered 1 to 50. Find probability that the number on the card –
  - (i) is divisible by 5,
  - (ii) has 2 at the unit place.
- (c) Define each of the following terms :
  - (i) Deterministic Experiment
  - (ii) Sample Space
  - (iii) Mutually Exclusive Events
  - (iv) Relative Complementation of  $A$  with respect to  $B$
- (d) The probability distribution of a random variable  $X$  is given below :

$X$	0	1	2	3
$P[X = x]$	0.1	0.3	0.5	0.1

- (i) Find Mean and Variance of  $X$ .
- (ii) If  $Y = 2x + 5$ , find the probability distribution of  $y$ .
- (e) Does mutual exclusiveness of two events imply their independence ? Justify your answer. Is converse true ? Justify.
- (f) From a bag containing 4 white and 6 red balls, 3 balls are drawn at random. Find expected number of white balls drawn.

**Q.3) Attempt any four of the following :**

**[4x4=16]**

- (a) Define cumulative distribution function of a continuous random variable. State its important properties.
- (b) The number of monthly breakdowns of a computer is a random variable having Poisson distribution with parameter  $\lambda = 1.8$ . Find probability that this computer will function for a month –
  - (i) without a breakdown
  - (ii) with only one breakdown
  - (iii) with at most two breakdowns
- (c) Define Binomial Distribution. Give one real life situation where Binomial Distribution can be applied. State additive property and recurrence relation for Binomial probabilities of Binomial Distribution.
- (d) An automobile safety engineer claims that 1 in 10 automobile accidents is due to driver fatigue. What is the probability that at least 3 to 5 automobile accidents are due to driver fatigue.
- (e) Define uniform distribution of a continuous random variable. State expression for its variance. Describe procedure to draw a random sample of size  $n$  from the above distribution.
- (f) Let  $A$  and  $B$  are two events defined on  $\Omega$ , such that  $P(A) = 0.8$ ,  $P(B) = 0.50$ ,  $P(A \cap B) = 0.45$ . Find  $P(B/A)$ ,  $P(A' / B')$ .

**Q.4) Attempt any two of the following :**

**[2x8=16]**

- (a) (i) Define Continuous Random Variable. Also define Mean and Variance of a Continuous Random Variable.
- (ii) Let  $X$  be a Continuous Random Variable with probability density function,

$$f(x) = \begin{cases} \frac{x}{6} + k, & \text{if } 0 \leq x \leq 3 \\ 0 & \text{otherwise} \end{cases}$$

find  $k$ ,  $P(1 \leq x \leq 2)$ .

- (b) (i) State relation between Bernoulli Distribution and Binomial Distribution. Also state approximation between Poisson Distribution and Binomial Distribution.
- (ii) If  $X \rightarrow U[a, 10]$  and  $P[3 \leq x \leq 7] = 0.5$ , find value of 'a' and plot probability density function.
- (c) (i) Write stepwise procedure of Large Sample Test for testing  $H_0 : \mu = \mu_0$  vs  $H_1 : \mu \neq \mu_0$ , where symbols have their usual meanings.
- (ii) In a sample of 1000 people in Maharashtra 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat eaters are equally popular in this state at 1% level of significance ?
- (d) (i) State any four properties of Normal Distribution.
- (ii) A random variable x has following probability density function :

$$f(x) = \frac{1}{2\sqrt{2\pi}} e^{-\frac{1}{8}(x-5)^2} \quad -\infty < x < \infty$$

Identify distribution of x. Find Mean and Variance of x. Also compute  $P(-5 \leq x \leq 5)$ .

**Q.5) Attempt any two of the following :**

**[2x8=16]**

- (a) (i) Define Normal Distribution. Let X and Y be two independent normally distributed random variables with parameters  $(\mu_1, \sigma_1^2)$  and  $(\mu_2, \sigma_2^2)$  respectively. Obtain distribution of  $X + Y$ . Also obtain distribution of  $ax + by + c$ , where a, b, c are constants.
- (ii) If  $X \rightarrow N(1, 9)$  and  $Y \rightarrow N(2, 16)$  are independent random variables, calculate  $P(X + Y \geq 5)$  and  $P(X \geq Y)$ .

- (b) (i) Define Exponential Distribution with parameter  $\theta$ . Also, state its properties.
- (ii) Suppose that component life times are exponentially distributed with mean 1000 hours. Find probability that a component survives more than 1500 hours. Also find Median and Standard Deviation of component life time.
- (c) (i) Write stepwise procedure of small sample test for testing  $H_0 : \mu = \mu_0$  vs  $H_1 : \mu \neq \mu_0$ , where symbols have their usual meanings.
- (ii) With the help of the following data find out whether there is any relationship between smoking and drinking. Use 1% level of significance.

	<b>Drinking</b>	<b>Non-drinking</b>
<b>Smoking</b>	74	26
<b>Not Smoking</b>	10	30

- (d) (i) Write stepwise procedure of Run Test to test randomness of given sample.
- (ii) Following sequence of 10 random numbers from  $U(10, 20)$  was generated using a random number generator.  
 14.3, 10.2, 16.5, 12.9, 11.3, 17.3, 12.4, 15.2, 19.6, 19.8.  
 Test whether the sequence has population median 15.  
 (Use 5% level of significance.)

Total No. of Questions : 5]

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**F. Y. B. Sc. (Computer Science) Examination - 2009**

**STATISTICS**

**PAPER - I**

**STATISTICAL METHODS - I**

**(2004 Pattern)**

**Time : 3 Hours]**

**[Max. Marks : 80**

***Instructions :***

- (1) All questions are compulsory.*
  - (2) Figures to the right indicate full marks.*
  - (3) Use of scientific calculator and statistical tables are allowed.*
  - (4) Symbols have their usual meanings unless otherwise stated.*
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**Q.1) Attempt each of the following :**

**[8x2=16]**

- (a) Calculate Median and Upper Quartile for the following observations :  
61, 62, 63, 62, 63, 62, 64, 64, 60, 65, 62, 63
- (b) State empirical relation between Mean, Median, Mode for a Data Set.
- (c) Given that  $\mu'_1 = 2$ ,  $\mu'_2 = 20$ , find standard deviation.
- (d) When is the value of Standard Deviation for a Data Set Zero ?  
Give one example.
- (e) Calculate  $R_{3.12}$  when  $r_{12} = 0.6$ ,  $r_{13} = 0.7$ ,  $r_{23} = 0.65$ .

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**P.T.O.**

- (f) Sketch scatter diagram for the following types :
- (i) Perfect Positive Correlation
  - (ii) Perfect Negative Correlation
- (g) Compute Correlation Co-efficient for the following data :
- $n = 100, \bar{X} = 50, \bar{Y} = 60, \sigma_x = 20, \sigma_y = 22,$   
 $\sum(X - 50)(Y - 60) = 9000.$
- (h) Distinguish between Seasonal Variation and Cyclic Variation.

**Q.2) Attempt any four of the following :**

**[4x4=16]**

- (a) Draw a Pie diagram to represent the following data :

Component	Cost of construction of a house
Labour	25%
Bricks	15%
Cement	20%
Steel	15%
Timber	10%
Supervision	15%

- (b) Explain Scope of Statistics in Management Science.
- (c) The arithmetic mean of the following frequency distribution is 5. Find the value of 'a' :

<b>Variable</b>	2	4	6	8
<b>Frequency</b>	a - 1	a + 1	a + 1	2a - 5

- (d) State requisites of a good measure of Central Tendency.
- (e) Define raw and central moment for a frequency distribution. Also express third central moment in terms of raw moments.

- (f) The Mean and Standard Deviation of 20 observations is found to be 10 and 2 respectively. At the time of checking it was found that one value 5 was incorrect. Calculate Mean and Standard Deviation, if wrong value is replaced by 8.

**Q.3) Attempt any four of the following :**

**[4x4=16]**

- (a) Explain concept of skewness of a Data Set. Discuss Bowley's Co-efficient of Skewness.
- (b) Given that mean = 160, mode = 157,  $\sigma = 50$ , find –
- (i) Karl Pearson's Co-efficient of Skewness
- (ii) Median
- (iii) Co-efficient of Variation
- (c) Explain the concept of dispersion of a data set. Discuss utility of relative measures of dispersion.
- (d) Calculate Standard Deviation and Co-efficient of Variation for the following frequency distribution of number of runs scored by a batsman in an inning :

<b>No. of Runs Scored</b>	0–20	20–40	40–60	60–80	80–100
<b>No. of Innings</b>	3	7	15	11	4

- (e) Explain the concept of Kurtosis. Discuss types of Kurtosis with the help of suitable diagram.
- (f) For a frequency distribution, standard deviation is 5. Find value of fourth central moment, if distribution is –
- (i) mesokurtic,
- (ii) platykurtic.



**Q.4) Attempt any two of the following :**

**[2x8=16]**

- (a) Explain the concept of Correlation for Bivariate Data. Comment on the statement, "Correlation fails to measure non-linear relationship." Also compute correlation co-efficient and interpret its value for the following data :

<b>X</b>	2	3	4	5	6
<b>Y</b>	10	13	16	19	22

- (b) Describe stepwise procedure for obtaining line of regression of Y on X using the method of least squares. The two regression lines between height (X) in inches and weight (Y) in lbs. of male students are :

$$4y - 15x + 550 = 0 \text{ and}$$

$20x - 3y - 975 = 0$ . Find mean height and weight of the groups. Also estimate weight of a boy whose height is 80 inches.

- (c) Fit a curve of the type  $Y = ab^x$  using least squares principle to the following data :

<b>Year (X)</b>	2000	2001	2002	2003	2004
<b>Production (Y) (in tonnes)</b>	5	40	135	320	625

Also estimate production for the year 2005.

- (d) What is Time Series ? Discuss cyclic variation as a component of time series. Calculate three-yearly moving averages of the data given below :

<b>Year</b>	1980	1981	1982	1983	1984	1985	1986	1987
<b>Purchase (Millions of Rs.)</b>	36	43	43	34	44	54	54	34

**Q.5) Attempt any two of the following :**

**[2x8=16]**

(a) Explain the concept of multiple regression for a trivariate data. Write stepwise procedure for obtaining the equation of plane of regression of  $X_1$  on  $X_2$  and  $X_3$ .

(b) In a trivariate distribution on :

$X_1$  : marks in Economics

$X_2$  : marks in Statistics

$X_3$  : marks in Mathematics

$\bar{X}_1 = 68, \bar{X}_2 = 70, \bar{X}_3 = 74,$

$\sigma_1 = 10, \sigma_2 = 5, \sigma_3 = 9,$

$r_{12} = 0.6, r_{13} = 0.7, r_{23} = 0.6.$

Determine equation to plane of regression of  $X_3$  on  $X_1$  and  $X_2$ .

Estimate marks in Mathematics when marks in Economics are 70 and marks in Statistics are 75.

(c) (i) Explain the concept of Weighted Arithmetic Mean. State advantages of Weighted Arithmetic Mean over Simple Arithmetic Mean.

(ii) Consider the following data on number of days of absentees of a student in a semester :

No. of Days	0-5	5-10	10-15	15-20	20-25
No. of Students	3	8	17	12	10

Compute Mode for the above data.

- (d) Explain the concept of Multiple Correlation and Partial Correlation for a Trivariate Data.

If  $r_{12} = r_{13} = r_{23} = r$ , ( $r \neq 1$ ), then show that

$$(i) \quad R_{1.23}^2 = \frac{2r^2}{1+r}$$

$$(ii) \quad r_{12.3} = \frac{r}{1+r}$$

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Total No. of Questions : 5]

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**F. Y. B. Sc. (Computer Science) Examination - 2009**

**ELECTRONICS**

**PAPER - II**

**DIGITAL ELECTRONICS**

**(2004 Pattern)**

**Time : 3 Hours]**

**[Max. Marks : 80**

***Instructions :***

- (1) *All questions are compulsory.*
  - (2) *Use of non-programmable electronic calculator is allowed.*
  - (3) *Draw neat diagrams wherever necessary.*
- 
- 

**Q.1) Attempt the following :**

**[8x2=16]**

- (a) What is 1's complement of Binary Number ? Find 2's complement of Decimal Number 16.
- (b) Draw diagram of XOR Gate using basic gates, also write truth table and Boolean Equation for XOR Gate.
- (c) Find Pulse Width for Monostable Multivibrator if  $R = 100k\Omega$ ,  $C = 0.1\mu F$ .
- (d) What are the types of ADCs ? Which is the fastest ADC ?
- (e) Write logical function of the following IC :
  - (i) 74150
  - (ii) 74148
  - (iii) 74138
  - (iv) 74154

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**1**

**P.T.O.**

- (f) State DeMorgan's both Theorems.
- (g) Give two advantages of binary R-2R ladder DAC.
- (h) Define memory parameter :
  - (i) Access Time
  - (ii) Capacity

**Q.2) Attempt any four of the following :** **[4x4=16]**

- (a) Calculate analog output for 5 bit binary weighted resistive DAC for inputs :
  - (i) 11011
  - (ii) 10000
  - (iii) 11111
  - (iv) 10101

Assume '1' level = 10V and '0' level = 0V.

- (b) Explain 3-bit full adder logical circuit.
- (c) Explain R-S Flip-flop with its logic diagram and truth table.
- (d) Explain 4 : 1 multiplexer with a suitable diagram.
- (e) Solve the following :
  - (i)  $(1010)_2 + (1000)_2$
  - (ii)  $(1A2)_{16} + (179)_{16}$
- (f) Draw internal block diagram of IC555.

**Q.3) Attempt any four of the following :** **[4x4=16]**

- (a) Explain with a neat diagram the working of successive approximation ADC.
- (b) Simplify the following Boolean Expression and draw circuit diagram for simplified equation :

$$Y = \bar{A} \bar{B} \bar{C} \bar{D} + \bar{A} \bar{B} C \bar{D} + \bar{A} B \bar{C} \bar{D} + \bar{A} B C \bar{D} + \bar{A} B \bar{C} D + \bar{A} B C D + A \bar{B} \bar{C} \bar{D} + A \bar{B} C \bar{D} + A \bar{B} C D + A B \bar{C} \bar{D} + A B C \bar{D} + A B C D$$

using K-map.

- (c) Explain 3-bit Down Counter.
- (d) Explain with neat diagram 1-bit Cell of SRAM.
- (e) Construct Odd Parity Hamming Code for Binary Data 11010.
- (f) Draw logic diagram of 3 : 8 decoder and write its truth table.

**Q.4)** Attempt **any two** of the following : **[2x8=16]**

- (a) What do you mean by Tree Demultiplexer ? Design 1 : 16 demultiplexer using 1 : 4 line demultiplexer.
- (b) Why NAND and NOR Gate are called Universal Gates ? Construct using NAND Gate the following gates :
  - (i) AND
  - (ii) OR
  - (iii) NOT
- (c) Draw and explain astable multivibrator using IC555 and find frequency and duty cycle for astable multivibrator if  $V_{CC}=10V$ ,  $C = 0.1\mu F$ ,  $R_A = 1k\Omega$  and  $R_B = 4.7k\Omega$ .
- (d) What is Decade Counter ? Explain with truth table, timing diagram and logical diagram decade counter (MOD-10).

**Q.5)** Attempt **any one** of the following : **[1x16=16]**

- (a) (i) Convert the following :
  - (a)  $(1010)_{\text{Gray}} = (?)_2$
  - (b)  $(101011)_2 = (?)_8$
  - (c)  $(127)_{10} = (?)_{\text{BCD}}$
  - (d)  $(10101)_2 = (?)_{10}$
- (ii) Prove the following identities :
  - (a)  $A + AB = A$
  - (b)  $AB + A\bar{B} = A$
  - (c)  $AC + ABC = AC$
  - (d)  $A + \bar{A}\cdot B = A + B$

- (b) (i) Explain 3-bit flash ADC. Write its advantages and disadvantages.
- (ii) (a) Draw parallel in parallel 4-bit shift register.
- (b) Explain working of diode matrix ROM.
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Total No. of Questions : 5]

[Total No. of Printed Pages : 4

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**F. Y. B. Sc. (Computer Science) Examination - 2009**

**ELECTRONICS**

**PAPER - I**

**LINEAR ELECTRONICS**

**(2004 Pattern)**

**Time : 3 Hours]**

**[Max. Marks : 80**

**Instructions :**

- (1) *All questions are compulsory.*
- (2) *Use of non-programmable electronic calculator is allowed.*
- (3) *Draw neat diagrams wherever necessary.*

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**Q.1) Attempt all of the following :**

**[8x2=16]**

- (a) What is Load Regulation of Power Supply ?
- (b) Draw symbols of :
  - (i) Variable Resistor
  - (ii) n-CH FET
  - (iii) Photo Diode
  - (iv) n-p-n transistor
- (c) Draw block diagram of SMPS. (Switch Mode Power Supply)
- (d) State different configurations of Differential Amplifier.
- (e) CE Configuration is widely used in amplifiers. Why ?
- (f) Explain working principle of Transformer.

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**1**

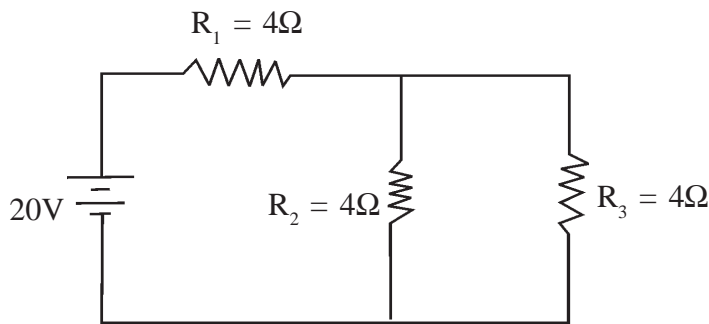
**P.T.O.**



- (g) Define :
- (i) Transconductance
  - (ii) Pinchhoff's Voltage
- (h) State Data Transfer Rate of UTP Cable and Optical Fiber Cable.

**Q.2)** Attempt **any four** of the following : **[4x4=16]**

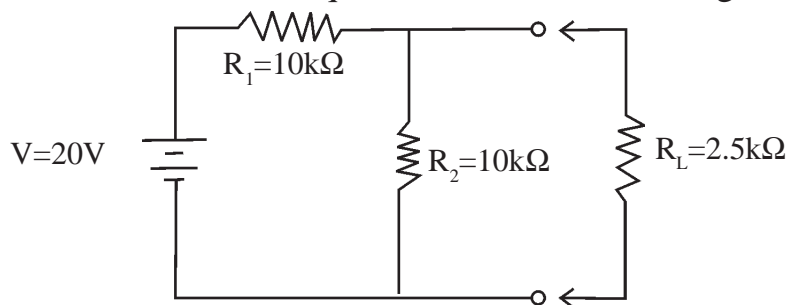
- (a) Draw block diagram of On-line UPS. Explain each block in detail.
- (b) Find current flowing through  $R_1$ ,  $R_2$  and  $R_3$  in the following circuit using KVL and KCL.



- (c) Explain potential divider biasing for a transistor.
- (d) What is Barkhausen Criteria to sustain oscillation ? Find frequency of Wein Bridge Oscillator if  $R = 10k\Omega$ ,  $C = 10\text{ nF}$ .
- (e) Explain characteristics of Zener Diode and name any one application of Zener Diode.
- (f) Write names of Connectors. Which peripheral devices are connected to computer using these connectors.

**Q.3)** Attempt **any four** of the following : **[4x4=16]**

- (a) Draw Thevenin's Equivalent Circuit of the given circuit :

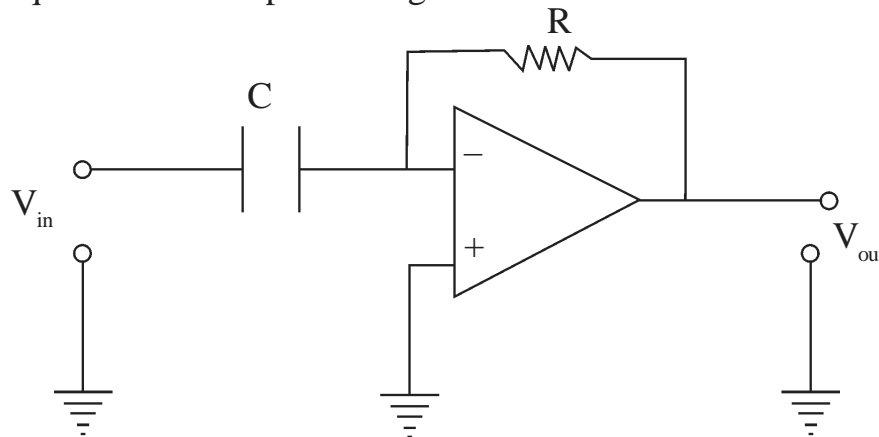


- (b) Explain Action of Photodiode. State an example where photodiode is used.
- (c) Define  $\alpha$  and  $\beta$  of Transistor. Derive equation of  $\beta$  in terms of  $\alpha$ .
- (d) Draw circuit diagram of Non-inverting Operational Amplifier and derive relation for its voltage gain.
- (e) What is Positive Feedback ? How it can be used to build oscillator from an amplifier ?
- (f) Explain charging and discharging transient response of RC circuit.

**Q.4)** Attempt **any two** of the following :

**[2x8=16]**

- (a) Explain working principle of n-CH FET with characteristic diagram. How JFET works as Voltage Variable Resistor (VVR) ?
- (b) What is an Unity Gain Amplifier ? For the given circuit derive equation for output voltage :

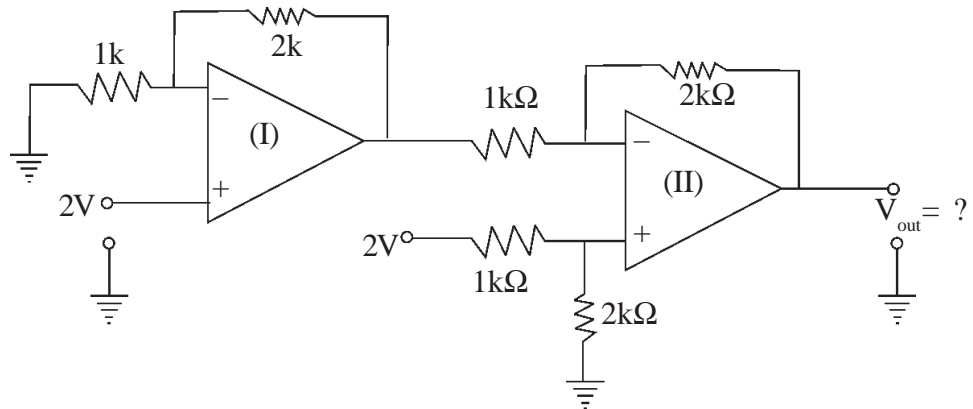


- (c) Describe different types of Inductors. Find series and parallel equivalent of Inductor if  $L_1 = 100 \text{ mH}$ ,  $L_2 = 1000 \text{ } \mu\text{H}$ .
- (d) (i) Define :
  - (1) Cut-off Point
  - (2) Saturation Point
  - (3) Operating Point
  - (4) DC Load Line of Transistor
- (ii) Explain working of p-n-p Transistor.

**Q.5) Attempt any one of the following :**

**[1x16=16]**

- (a) (i) State Maximum Power Transfer Theorem and find power transfer for voltage source 100V and if load changes  $R_L = 0.5k\Omega$ ,  $R_L = 1k\Omega$  and  $R_L = 1.5k\Omega$  if internal resistance of voltage source  $R_i = 1k\Omega$ . Also comment on result.
- (ii) Define  $A_d$ ,  $A_c$  and CMMR of differential amplifier and find  $A_d$ ,  $A_c$  and CMRR for input voltages  $V_1 = 10mV$ ,  $V_2 = 5mV$ , the output voltage  $V_{out} = 2V$ .
- (b) (i) For the following circuit find out final output voltage. Identify function of each block.



- (ii) What is MOSFET ? Explain working of depletion and enhancement mode MOSFET.

Total No. of Questions : 5]

[Total No. of Printed Pages : 4

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F. Y. B. Sc. (Computer Science) Examination - 2009

MATHEMATICS

PAPER - III

GEOMETRY AND CALCULUS

(2004 Pattern)

Time : 3 Hours]

[Max. Marks : 80

*Instructions :*

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

**Q.1)** Attempt **each** of the following :

[16]

- (a) A line in XZ-plane makes angle  $30^\circ$  with X-axis. Find its direction cosines.
- (b) Show that the points (2, 3, 1), (3, 9, 4) and (1, -3, -2) are collinear.
- (c) The Cartesian equation of a line is

$$\frac{x + 1}{2} = \frac{y + 3}{3} = \frac{z + 2}{-1}$$

Write it in vector form.

- (d) Show that the line  $\vec{r} = (2\hat{i} + \hat{j} + \hat{k}) + t(3\hat{i} + 5\hat{j} - 2\hat{k})$  is perpendicular to the plane  $\vec{r} \cdot (6\hat{i} + 10\hat{j} - 4\hat{k}) = 5$ .

- (e) Is the series  $\sum_{n=1}^{\infty} \frac{1}{n^{1/3}}$  divergent ? Justify.

- (f) Does  $\lim_{n \rightarrow \infty} (-1)^n \left(1 + \frac{1}{n}\right)$  exists ? Justify.

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P.T.O.

- (g) If  $y = \log(3 - 5x)$  then find  $y_n$ .
- (h) If  $f(x) = \log x$ , defined on  $[1, e]$ , satisfy Lagrange's Mean Value Theorem then find the value of  $C$  between 1 and  $e$ .

**Q.2) Attempt any four of the following :** **[16]**

- (a) Derive vector equation of a line passing through two points  $C(\bar{c})$  and  $D(\bar{d})$ .

- (b) Show that the lines

$$\bar{r} = (4\hat{i} - 4\hat{j} - \hat{k}) + t(\hat{i} - 3\hat{j} + 7\hat{k}) \text{ and}$$

$$\bar{r} = (\hat{i} - \hat{j} - 10\hat{k}) + \zeta(2\hat{i} - 3\hat{j} + 8\hat{k}) \text{ intersect each other.}$$

Hence find position vector of the point of intersection.

- (c) Find vector equation of a plane passing through the points  $A(1, -1, 3)$ ,  $B(-3, 1, 6)$  and parallel to the vector  $\hat{i} + 2\hat{j} - 3\hat{k}$ .

- (d) Find angle between the lines

$$\bar{r} = (5\hat{i} - 2\hat{j} + 7\hat{k}) + t(2\hat{i} + \hat{j} - \hat{k}) \text{ and}$$

$$\bar{r} = (2\hat{i} + 2\hat{j} + \hat{k}) + \zeta(\hat{i} + 2\hat{j} + \hat{k}).$$

- (e) Find the shortest distance between the lines

$$\bar{r} = (\hat{i} + 2\hat{j} + 3\hat{k}) + t(2\hat{i} + 3\hat{j} + 4\hat{k}) \text{ and}$$

$$\bar{r} = (2\hat{i} + 3\hat{j} + 4\hat{k}) + \zeta(3\hat{i} + 4\hat{j} + 5\hat{k}).$$

Are they coplanar ?

- (f) Prove that the points  $A(\bar{a})$ ,  $B(\bar{b})$  and  $C(\bar{c})$  are collinear if and only if there exist scalars  $x, y, z$ , not all zero simultaneously, such that,  $x\bar{a} + y\bar{b} + z\bar{c} = \bar{0}$  with  $x + y + z = 0$ .

**Q.3) Attempt any four of the following :**

**[16]**

(a) Show that the sequence  $\langle x_n \rangle$  defined as,

$$x_1 = 1, x_{n+1} = \frac{4 + 3x_n}{3 + 2x_n}, n \geq 1 \text{ is convergent.}$$

Hence find its limit.

(b) Discuss convergence of the series  $\sum_{n=2}^{\infty} \frac{1}{2 \log n}$

(c) State L'Hospital's Rule and hence evaluate  $\lim_{x \rightarrow 0} (\sin x) (\log x)$ .

(d) If  $y = e^{\tan^{-1} x}$  then prove that,

$$(1 + x^2) y_{n+2} + [2(n + 1) x - 1] y_{n+1} + n(n + 1) y_n = 0.$$

(e) State and prove Cauchy's Mean Value Theorem.

(f) Discuss convergence of the series  $\sum_{n=1}^{\infty} \frac{n^n}{n!}$ .

**Q.4) Attempt any two of the following :**

**[16]**

(a) Show that the lines whose direction ratios are connected by the relations  $a + 2b + c = 0$  and  $10a^2 - 15b^2 - 4c^2 = 0$  are perpendicular to each other.

(b) Derive vector equation of a plane containing the lines  $\bar{r} = \bar{a} + t \bar{b}$  and  $\bar{r} = \bar{c} + \zeta \bar{d}$ .

Hence find vector equation of the plane containing the lines

$$\bar{r} = (3\hat{i} + 2\hat{j}) + t(5\hat{i} + 3\hat{j} + \hat{k}) \text{ and}$$

$$\bar{r} = (-\hat{i} + 2\hat{j} - 3\hat{k}) + \zeta(-\hat{i} - 3\hat{j} + 2\hat{k}).$$

(c) Derive formula for the distance of a point  $C(\bar{c})$  from a line  $\bar{r} = \bar{a} + t\bar{b}$ , where  $t$  is a scalar.

- (d) (i) Find vector equation of the plane passing the point (2, 3, 1) and perpendicular to a line  $\vec{r} = (\hat{i} - 3\hat{j} + 4\hat{k}) + t(7\hat{i} - 3\hat{j} + \hat{k})$ .
- (ii) Find image of the point (1, -2, -1) in the plane  $\vec{r} \cdot (\hat{i} + 2\hat{j} + 3\hat{k}) = 0$ .

**Q.5) Attempt any two of the following :**

**[16]**

- (a) State Taylor's Theorem with Cauchy's form of remainder. Also expand the function  $f(x) = 7x^6 - 3x^5 + x^2 + 2$  in powers of  $(x - 2)$ .
- (b) State and prove Leibnitz's Theorem. Also, find  $y_n$  if  $y = x^2 \cdot \cos x$ .
- (c) (i) Discuss continuity of  $f(x)$  at  $x = 0$ , where

$$f(x) = \begin{cases} x^2 \cdot \sin \frac{1}{x} & , \quad \text{if } x \neq 0 \\ 0 & , \quad \text{if } x = 0 \end{cases}$$

- (ii) Prove that the series  $\sum \frac{(n+1)}{n^3} x^n$  is convergent, if  $x < 1$ .
- (d) (i) Show that the following sequence is convergent :  
0.7, 0.77, 0.777, 0.7777, .....
- (ii) Discuss convergence of the sequence  $\langle x_n \rangle$ , where  $x_n = \frac{1}{3} + 2(-1)^n$ , for all  $n \geq 1$ .

Total No. of Questions : 5]

[Total No. of Printed Pages : 4

**[3618]-54**

**F. Y. B. Sc. (Computer Science) Examination - 2009**

**MATHEMATICS**

**PAPER - II**

**ALGEBRA AND NUMERICAL METHODS**

**(2004 Pattern)**

**Time : 3 Hours]**

**[Max. Marks : 80**

**Instructions :**

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

**Q.1) Attempt each of the following :**

**[16]**

- (a) Express  $Z = i^4 + i^3$  in polar form.
- (b) Give an example of a relation which is symmetric but not transitive.
- (c) For any three integers  $a, b, c$  if  $(b, c) = 1$  and  $a/b$ , then prove that  $(a, c) = 1$ .
- (d) Find  $\phi(31)$ , where  $\phi$  is Euler's  $\phi$  - function.
- (e) Evaluate  $\left(\frac{\Delta}{E}\right) x^3$ , taking  $h = 1$ .
- (f) Evaluate  $\int_{-1}^1 x^2 dx$ , by trapezoidal rule, taking  $h = 1$ .



- (g) Let  $\frac{dy}{dx} = x - y$ , with  $y(0) = 1$ , obtain  $y(1)$  by Euler's Method.
- (h) Write an algorithm for exchanging the values of two variables.

**Q.2) Attempt any four of the following :**

**[16]**

- (a) For any  $Z_1, Z_2 \in \mathcal{C}$ , show that  
 $|Z_1 + Z_2| \leq |Z_1| + |Z_2|$
- (b) Let  $R$  be a relation on  $A = \{1, 2, 3, 4\}$  defined as "aRb if and only if  $a < b$ " and  $S$  be a relation defined as "aSb if and only if  $a > b$ ". Find  $SoR$ ,  $RoS$ .
- (c) Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  defined as  $f(x) = \frac{5x - 3}{2}$ ,  $\forall x \in \mathbb{R}$  show that  $f$  is bijective. Obtain formula for  $f^{-1}$ .
- (d) Find remainder of  $8^{369}$  when divided by 11.
- (e) Obtain multiplication table for  $Z_6$ . List elements which satisfy  $x^2 = 1$ .
- (f) Obtain Newton Raphson Formula for square root of any positive number. Hence find  $\sqrt{89}$ .

**Q.3) Attempt any four of the following :**

**[16]**

- (a) Given that,  $\sin 45^\circ = 0.7071$ ,  $\sin 50^\circ = 0.7660$   
 $\sin 55^\circ = 0.8192$ ,  $\sin 60^\circ = 0.8669$   
 Find  $\sin 47^\circ$ .

- (b) Evaluate  $\int_0^{\pi/2} \sin x \cdot dx$ , by Simpson's  $\frac{3}{8}$ th rule (Take  $h = \frac{\pi}{12}$ )

- (c) Given  $\frac{dy}{dx} = x - y^2$  with  $y(0) = 1$ . Evaluate  $y(0.1)$  by Taylor's Series Method.

- (d) Solve the following system of linear equation by Gauss Elimination Method.

$$x_1 + \frac{1}{2}x_2 + \frac{1}{3}x_3 = 1, \quad \frac{1}{2}x_1 + \frac{1}{3}x_2 + \frac{1}{4}x_3 = 0,$$

$$\frac{1}{3}x_1 + \frac{1}{4}x_2 + \frac{1}{5}x_3 = 0$$

- (e) Find  $y'(1)$  and  $y''(1)$  from the given data :

x	-1	0	1	2	3
y	-2	-1	-2	1	14

- (f) Write an algorithm to convert decimal number to a new base.

**Q.4) Attempt any two of the following :** **[16]**

- (a) State and prove De-Moivre's Theorem.  
 (b) Show that 9899 and 1112 are relatively prime and hence find m and n such that

$$1 = 9899m + 1112n.$$

- (c) Explain Regula Falsi Method to find an approximate real root of  $f(x) = 0$  and hence find the real root of  $x^3 - 2x^2 + 3x - 4 = 0$ .

- (d) Solve the following system of linear equation by Gauss Seidel Iterative Method.

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

$$2x + 10y + z = 4$$

$$x - 2y + 10z = 5$$

**Q.5) Attempt any two of the following :** **[16]**

- (a) Derive Lagranges Interpolation Formula for Unequal Interval. Hence find  $f(x)$  for given data :

x	-1	1	2
y	-1	-1	5

- (b) Derive Simpson's  $\frac{1}{3}$ rd Rule.

Hence evaluate  $\int_{-1}^3 (x^2 - x) dx$

(Take  $h = 0.5$ )

- (c) Using Runge Kutta Fourth Order Method, find  $y(0.1)$  and  $y(0.2)$ , given  $\frac{dy}{dx} = y - x$  with  $y(0) = 1$ .
- (d) Write an algorithm to sort a given array by selection method and apply it to sort the following array :

50	32	5	17	39	8	19
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Total No. of Questions : 5]

[Total No. of Printed Pages : 5

[3618]-53

F. Y. B. Sc. (Computer Science) Examination - 2009

MATHEMATICS

PAPER - I

DISCRETE MATHEMATICS

(2004 Pattern)

Time : 3 Hours]

[Max. Marks : 80

*Instructions :*

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

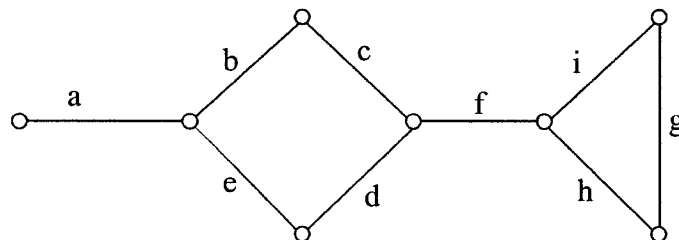
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Q.1) Attempt the following :

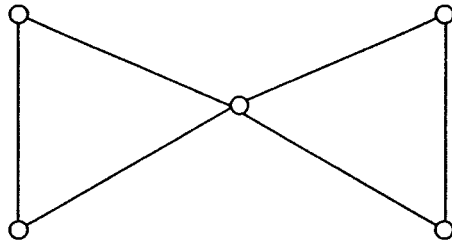
[16]

- (a) State Second Principle of Mathematical Induction.
- (b) How many arrangements are there of letters in the word 'SWINE' ?
- (c) Solve the recurrence relation  
$$a_r - 2a_{r-1} = 0$$
- (d) Translate the following into symbolic form :
  - (i) I do not work hard only if I am awake and I do not dream of home.
  - (ii) It will rain tomorrow or it will snow tomorrow.
- (e) Draw all possible 4-regular graphs on 2 vertices.
- (f) Find all bridges in the following graph :



- (g) Define :
  - (i) Complete graph
  - (ii) Balanced digraph

- (h) Find Edge Connectivity and Vertex Connectivity of the following graph :



**Q.2) Attempt any four of the following :**

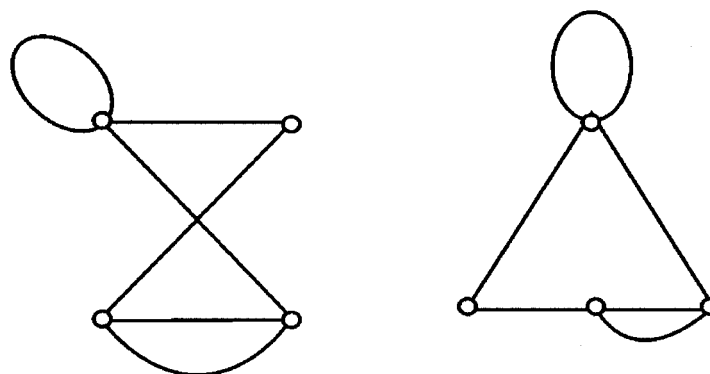
**[16]**

- (a) Using Mathematical Induction prove that  $5^n - 4n - 1$  is divisible by 16, for all  $n \geq 1$ .
- (b) Show that at a party of 20 persons, there are two persons who have same number of friends.
- (c) Find coefficient of  $x^{23}$  in  $(x^2 + x^3 + x^4 + \dots)^5$ .
- (d) Solve recurrence relation  
 $a_r - 8a_{r-1} + 16a_{r-2} = 0$  with initial condition  $a_2 = 16, a_3 = 48$ .
- (e) Give direct proof of the following argument :  
 $R \rightarrow C, S \rightarrow \sim W, R \vee S, W \vdash C$
- (f) Using combinatorial argument, prove that  
 ${}^n c_0 + {}^n c_1 + {}^n c_2 + \dots + {}^n c_n = 2^n$  for all  $n \in \mathbb{N}$ .

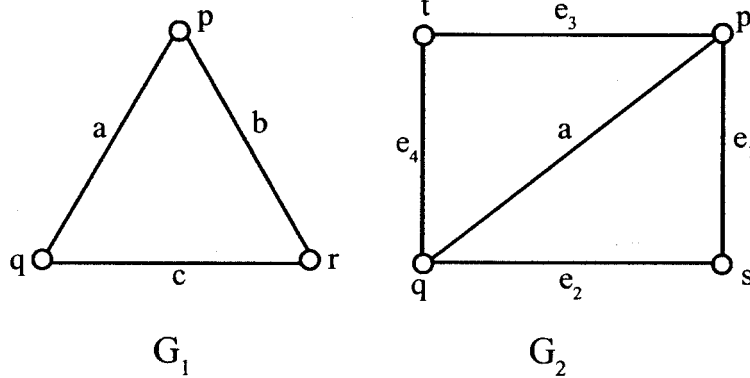
**Q.3) Attempt any four of the following :**

**[16]**

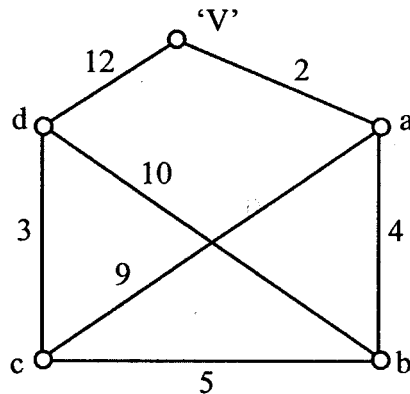
- (a) Show that the following graphs are isomorphic :



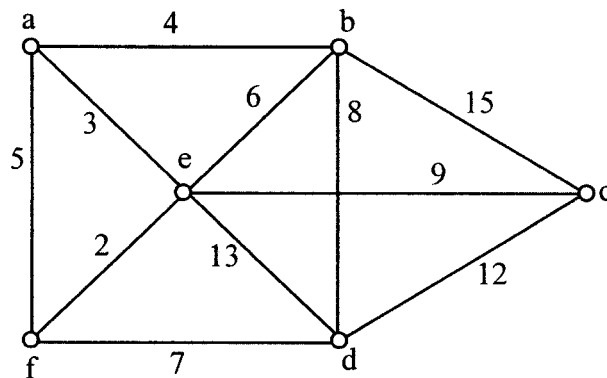
- (b) From the following two graphs  $G_1$  and  $G_2$ , find  $G_1 \cup G_2$  and  $G_1 \oplus G_2$ .



- (c) Solve travelling sales person problem for sales person based at 'V' in the following graph :



- (d) Prove that there is one and only one path between any two vertices in a tree.
- (e) Draw arborescence for the following expression and express it in polish notation :  
 $(7x + 3y)^4 \div (6a - 11b)$
- (f) Using Kruskal's algorithm find the shortest spanning tree in the following graph :



**Q.4) Attempt any two of the following :**

**[16]**

(a) (i) Find number of integers between 1 and 2100 that are divisible by 2 or 3 or 7.

(ii) Using Mathematical Induction, prove that

$$2 + 8 + 18 + \dots + 2n^2 = n^2 + n, \text{ for all } n \geq 1.$$

(b) Solve the following recurrence relation :

$$a_r = a_{r-1} + 2a_{r-2} + 7 \quad (5^r) \text{ with initial condition } a_0 = 11, a_1 = 28$$

(c) Prove validity of the following argument by using method of indirect proof.

“If Meena marries Rohit, she will be in Nasik.

If Meena marries Tanmay, she will be in Baramati.

If she is either in Nasik or Baramati, she will definitely be settled in life. She is not settled in life. Thus she did not marry Rohit or Tanmay.”

(d) (i) Use a generating function for finding the number of distributions of 27 identical balls, into five distinct boxes if each box has between 3 and 8 balls.

(ii) Express the following statements in symbolic form using quantifiers. Also write their negation.

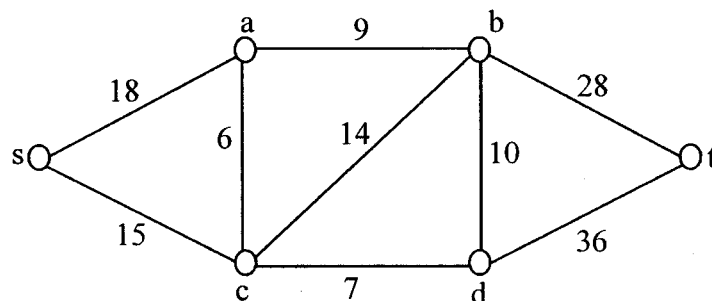
(1) No Rabbit knows calculus.

(2) All Bollywood Movies are serious.

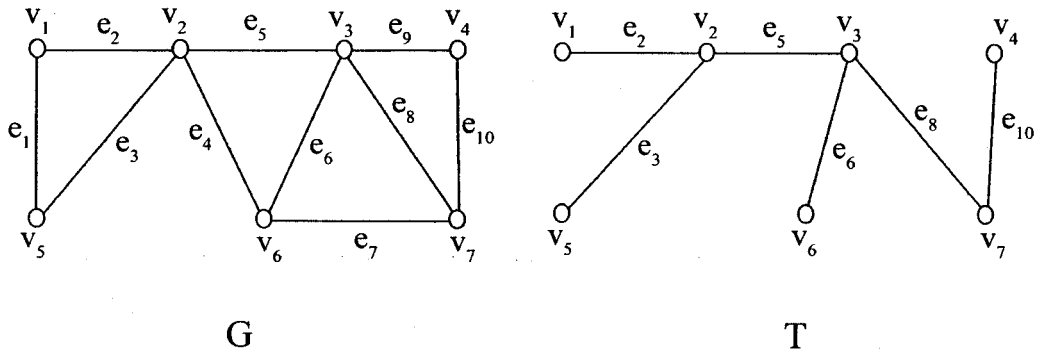
**Q.5) Attempt any two of the following :**

**[16]**

(a) Using Dijkstra's Algorithm find shortest path from the vertex 's' to all other vertices in the graph below :



- (b) Find all fundamental circuits and fundamental cutsets of connected graph  $G$  with respect to the given spanning tree  $T$ ; given below.



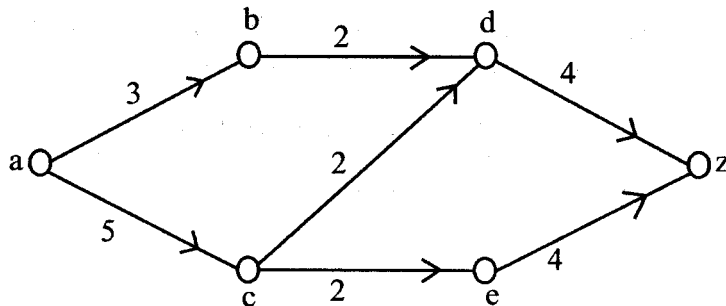
- (c) (i) Let  $G$  be a connected graph. Then  $G$  is an Euler graph if and only if every vertices of  $G$  is of even degree.
- (ii) If  $G$  is a simple connected non-trivial graph then prove that,

$$K(G) \leq \lambda(G),$$

where,  $K(G)$  is a vertex connectivity of  $G$

$\lambda(G)$  is an edge connectivity of  $G$ .

- (d) Using Ford-Fulkerson's Algorithm, find a maximal flow in the following network :





Total No. of Questions : 5]

[Total No. of Printed Pages : 4

**[3618]-52**

**F. Y. B. Sc. (Computer Science) Examination - 2009**

**COMPUTER SCIENCE**

**PAPER - II**

**INTRODUCTION TO PROGRAMMING AND PROGRAMMING IN 'C'**

**(2004 Pattern)**

**Time : 3 Hours]**

**[Max. Marks : 80**

**Instructions :**

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

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**Q.1) Answer the following : (Any Ten)**

**[1x10=10]**

- (1) What is meant by Compilation ?
- (2) What is the difference between Syntax Error and Logical Error ?
- (3) Determine which of the following numerical values is a valid constant :
  - (i) OXBCFDAL
  - (ii) 8.35e-12
- (4) What is meant by Associativity ?
- (5) What is the purpose of getchar() ?
- (6) Write appropriate declaration and assign the given initial values for each variable :
  - (i) Double - Precision Variable :  
 $nd = 2.88 \times 10^{-8}$
  - (ii) Character Variable :  
jay = newline character
- (7) Write names of Graphics Adapter Cards.

- (8) Determine values of following assignment expressions, where,  
float x = 0.05, y = - 0.001;  
int k = 3; char d = 'd';  
(i) k = (x > 0.1) ? x : d;  
(ii) k \* = (x \* y);
- (9) Write a syntax of Switch Statement.
- (10) How is a Pointer Variable declared and initialized ?
- (11) Name two storage class specifications included in C.
- (12) Explain meaning of the statement :  
long (\*p) [10] [20];

**Q.2) Answer the following : (Any Four) [5x4=20]**

- (a) What is Recursion ? Write a recursive function for sum of first n numbers.
- (b) Compare do...while with for statement.
- (c) What are Arguments ? What is their purpose ?
- (d) What is Nested Structure ? Give its example.
- (e) Explain Break and Continue Statement.

**Q.3) Answer the following : (Any Four) [5x4=20]**

- (a) Write an algorithm and draw a flowchart to convert Decimal Number to Octal Number.
- (b) Find and justify output of the following program segment :

```
main( )
{
    int i, j, x = 0;
    for (i = 0 ; i < 5; ++i)
        for (j = 0 ; j < i ; ++ j)
            {
                x + = (i + j -1);
                printf(“%d”, x);
            }
    printf(“\n x = %d”, x);
}
```

(c) Find and justify output of the following program segment :

```
int i, a = 1, b = 1;
void func()
{
    int a = 0;
    static int b = 0;
        a++;
        b++;
}
int main()
{
    i = 0;
    while (i < 5)
    {
        func();
        a++;
        b++;
        i++;
    }
    printf("a = %d b = %d \n", a, b);
}
```

(d) Find output of each code by using the given values :

```
float a = 2.5, b = 0.0007, c = 3000.0;
```

```
int i = 12356;
```

(i) `printf("% 3f %3f %3f" , a, b, c);`

(ii) `printf("%8d %-8d %3d", i, i, i);`

(iii) `printf("%e %12.4e", a, b);`

(iv) `printf("%+8f %8.3f", a, c);`

(v) `printf("%f %f %f", a, b, c);`

(e) Find and justify output of the following program segment :

```
# include <stdio.h>
# define SI (p, n, r) p * n * r/100
int main( )
{
    float p = 2500, r = 3.5;
    int n = 3;
    SI (p, n, r);
    SI (1500, 2, 2.5);
    return 0;
}
```

**Q.4) Answer the following : (Any Four) [5x4=20]**

(a) Write a program to accept dimensions of a cylinder and print surface area and volume.

(Surface Area =  $2\pi r^2 + 2\pi rh$ , Volume =  $\pi r^2 h$ )

(b) Write a program to accept real number X and integer n. Calculate sum of first n terms of the series :

$$\frac{1}{x} + \frac{2}{x^2} + \frac{3}{x^3} + \dots$$

(c) Write a program that uses function is prime, which accepts an integer as parameter and returns 1 if the number is prime and returns 0 otherwise.

(d) Write a program to read  $3 \times 3$  matrix and check if it is an identity matrix.

(e) Write a 'C' program to read a source.txt which has data in lowercase. Convert it to uppercase and store it into target file.

**Q.5) Answer the following : (Any Two) [5x2=10]**

(a) Write a note on memory allocation functions.

(b) Write syntax and usage of :

(i) strcpy( )

(ii) strcat( )

(iii) fputc( )

(iv) rectangle( )

(v) circle( )

(c) Write a note on Compiler Control Directives.

Total No. of Questions : 5]

[Total No. of Printed Pages : 3

**[3618]-51**

**F. Y. B. Sc. (Computer Science) Examination - 2009**

**COMPUTER SCIENCE**

**PAPER - I**

**INTRODUCTION TO COMPUTERS, DATA PROCESSING AND NETWORKING**

**(2004 Pattern)**

**Time : 3 Hours]**

**[Max. Marks : 80**

**Instructions :**

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

**Q.1) Answer the following : (Any Ten)**

**[1x10=10]**

- (1) What is meant by Protocol ?
- (2) What do you mean by Bombs Virus ?
- (3) What is Internet ?
- (4) What is meant by Operating System ?
- (5) What is meant by Printing Device ? List its types.
- (6) Explain Grep Command in Linux with example.
- (7) Which tag is used to create Hyperlinks ?
- (8) Which are the different ways in which a file can be saved in vi editor ?
- (9) What is meant by Clip Board ?
- (10) Explain any 2 uses of Network.
- (11) Explain Workstation and Server Concept.
- (12) What does the Exetention of File Name specify ?

**Q.2) Attempt any four :** **[5x4=20]**

- (a) Explain Loop Control Statements provided by shell with example.
- (b) Explain CRT Monitor in detail.
- (c) What are the different services provided by an Operating System ?
- (d) What are the different ways of protecting the Computer from Virus ?
- (e) Explain different types of Computers.

**Q.3) Attempt any four :** **[5x4=20]**

- (a) What are the features of MS-Word ?
- (b) Explain Internal DOS Commands in detail.
- (c) Explain OSI Model in brief.
- (d) Explain how file handling is done in PERL ?
- (e) Write purpose of Syntax of the following commands with example :
  - (i) Head
  - (ii) PWD
  - (iii) Cat
  - (iv) CP
  - (v) mkdir

**Q.4) Attempt any four :** **[5x4=20]**

- (a) Why is it important to have security on the server ? How can LAN Security be ensured ?
- (b) Explain attributes of <FONT> tag by giving proper example.
- (c) Explain basic block structure of Computer.
- (d) Differentiate between Dot-Matrix and Inkjet Printer.
- (e) What is Menu ? Explain its types in Windows Operating System.

**Q.5) Attempt any two :**

**[5x2=10]**

(a) Write HTML Code which generates the following output :

<b>Country</b>	<b>Population (In Crores)</b>	
<b>INDIA</b>	1998	85
	1999	90
	2000	100
<b>USA</b>	1998	30
	1999	40
	2000	45

- (b) Write a shell program to accept a string and count occurrence of characters in the string.
- (c) A file, student.lst, contains the name and marks of student (out of 20) in various tests.

Calculate and display total marks of all students and also display name of the student having highest total.

Write awk program for the above.

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Total No. of Questions : 5]

[Total No. of Printed Pages : 6

**[3618]-8**

**F. Y. B. Sc. (Computer Science) Examination - 2009**

**STATISTICS**

**PAPER - II**

**STATISTICAL METHODS - II**

**(June 2008 Pattern)**

**Time : 3 Hours]**

**[Max. Marks : 80**

**Instructions :**

- (1) *All questions are compulsory.*
  - (2) *Figures to the right indicate full marks.*
  - (3) *Use of scientific calculators is allowed.*
  - (4) *Use of statistical tables is allowed.*
  - (5) *Symbols have their usual meanings unless otherwise stated.*
- 

**Q.1) Attempt each of the following :**

**[8x2=16]**

- (a) State classical definition of probability of an event.
- (b) An unbiased coin is tossed six times. Find probability of getting at least five heads.
- (c) Define conditional probability of an event.
- (d) Consider the following frequency distribution of X :

X	1	2	3	4	5
P(X = x)	3k	5k	2k	k	k

Find :

- (i) value of k,
- (ii) distribution function of X.

**[3618]-8**

**1**

**P.T.O.**



- (e) State Baye's Theorem  
(f) Let  $X$  be a continuous random variable with p.d.f.

$$f(x) = \begin{cases} 3x^2 & ; 0 \leq x \leq 1 \\ 0 & ; \text{otherwise} \end{cases}$$

Find  $E(3X + 2)$

- (g) Define each of the following :
- (i) Critical Region
  - (ii) Type I Error
- (h) A random variable  $X$  has an exponential distribution with mean 10.

Find :  $P [(X \geq 10) / (X \geq 5)]$

**Q.2) Attempt any four of the following : [4x4=16]**

- (a) State and prove addition theorem of probability for two events  $A$  and  $B$  defined on a sample space.
- (b) The letters of the word COMPUTER are arranged at random. Find probability that vowels occupy even places.
- (c) Define each of the following :
  - (i) Deterministic Experiment
  - (ii) Sample Space
  - (iii) Mutually Exclusive Events
  - (iv) Relative Complementation of  $A$  w.r.t.  $B$
- (d) A statistical experiment consists of asking 3 housewives at random if they wash their dishes with brand  $X$  detergent.
  - (i) List elements of the sample space using 'Y' for yes and 'N' for no.
  - (ii) List elements of the event : "Second woman interviewed uses brand  $X$ ".
  - (iii) Find probability of the event in (ii) above if it is assumed that elements of sample space are equally likely to occur.

- (e) Does mutual exclusiveness of two events imply their independence ?  
Is converse true ? Justify your answers.
- (f) From a bag containing 5 white and 5 red balls, three balls are drawn at random. Find expected number of red balls drawn.

**Q.3)** Attempt **any four** of the following : **[4x4=16]**

- (a) Define cumulative distribution function of a continuous random variable. State its important properties.
- (b) If a random variable  $X$  follows poisson distribution such that  $P(X = 1) = P(X = 2)$ , find Mean and Standard Deviation of the Distribution. Also, find  $P(X = 0)$ .
- (c) Define Binomial Distribution. Give one real life situation where binomial distribution can be applied. State its additive property. Also, state recurrence relation for binomial probabilities.
- (d) A couple decides to have children until they have a male child. Find probability distribution of the number of children they would have before first male child. If probability of a male child in their community is  $1/3$ , how many children are they expected to have before the first male child is born ?
- (e) Define uniform distribution for a continuous random variable. State expression for its variance. Describe procedure to draw a random sample of size  $n$  from above distribution.
- (f) Consider an electronic assembly with two subsystems A and B. Suppose  $P(A \text{ fails}) = 0.1$ ,  $P(B \text{ alone fails}) = 0.05$  and  $P(A \text{ and } B \text{ both fail}) = 0.08$ .

Find :

- (i)  $P[A \text{ fails} / B \text{ has failed}]$
- (ii)  $P[A \text{ fails} / B \text{ does not fail}]$

- (d) (i) State any four properties of Normal Distribution.
- (ii) Time taken by the crew of a company to complete a target has normal distribution with mean 400 labour hours and standard deviation 100 labour hours. If the company has promised to complete target in 450 labour hours and has agreed to pay a penalty of Rs. 100 for every labour hour spent in excess of 450, find probability that company has to pay a penalty of at least Rs. 2,000.

**Q.5) Attempt any two of the following :**

**[2x8=16]**

- (a) (i) Define Normal Distribution. Let X and Y be two independent normally distributed random variables with parameters  $(\mu_1, \sigma_1^2)$  and  $(\mu_2, \sigma_2^2)$  respectively. Obtain distribution of  $(X + Y)$ . Also, obtain distribution of  $(aX + bY + c)$  where a, b, c are constants.
- (ii) Let  $X \sim N(1, 1)$  and  $Y \sim N(2, 4)$  be two independent random variables.  
Find –  
 $P[2X + Y > 3]$  and  $P[3X - 2Y \leq 10]$
- (b) (i) State p.d.f. of Pareto Distribution with parameter  $\alpha$ . Also state expressions of its Mean and Variance.
- (ii) The time duration that a watch will run without having to reset is a random variable with exponential distribution with mean 120 days. Find probability that such a watch will have to reset in less than 24 days. Also, find probability that watch does not need a reset for at least 180 days.
- (c) (i) Write stepwise procedure of small sample test for testing  $H_0 : \mu = \mu_0$  against  $H_1 : \mu \neq \mu_0$  where symbols have usual meanings.

- (d) (i) State any four properties of Normal Distribution.
- (ii) Time taken by the crew of a company to complete a target has normal distribution with mean 400 labour hours and standard deviation 100 labour hours. If the company has promised to complete target in 450 labour hours and has agreed to pay a penalty of Rs. 100 for every labour hour spent in excess of 450, find probability that company has to pay a penalty of at least Rs. 2,000.

**Q.5) Attempt any two of the following :**

**[2x8=16]**

- (a) (i) Define Normal Distribution. Let X and Y be two independent normally distributed random variables with parameters  $(\mu_1, \sigma_1^2)$  and  $(\mu_2, \sigma_2^2)$  respectively. Obtain distribution of  $(X + Y)$ . Also, obtain distribution of  $(aX + bY + c)$  where a, b, c are constants.
- (ii) Let  $X \sim N(1, 1)$  and  $Y \sim N(2, 4)$  be two independent random variables.  
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- (ii) The time duration that a watch will run without having to reset is a random variable with exponential distribution with mean 120 days. Find probability that such a watch will have to reset in less than 24 days. Also, find probability that watch does not need a reset for at least 180 days.
- (c) (i) Write stepwise procedure of small sample test for testing  $H_0 : \mu = \mu_0$  against  $H_1 : \mu \neq \mu_0$  where symbols have usual meanings.

- (ii) On the basis of the information given below, decide whether there is any association between inoculation and absence of attack of typhoid at 5% l.o.s.

	Attacked	Not Attacked
Innoculated	12	674
Not Innoculated	47	1122

- (d) (i) Write stepwise procedure of run test to test randomness of a given sample.

- (ii) Following are the values of weight gains in 9 mice after getting fed with a special diet :

20.1, 30.7, 28.3, 25.2, 26.7, 29.2, 35.6, 31.2, 37.3

Test using sign test whether population median is 28.

Total No. of Questions : 5]

[Total No. of Printed Pages : 5

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F. Y. B. Sc. (Computer Science) Examination - 2009

STATISTICS

PAPER - I

STATISTICAL METHODS - I

(June 2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

*Instructions :*

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

**Q.1) Attempt each of the following :**

**[8x2=16]**

- (a) State empirical relation between Mean, Median, Mode for a Data Set.
- (b) When is the value of Standard Deviation for a Data Set Zero ? Give one example.
- (c) Find first central moment and first raw moment of the numbers 0, 0, 0, 0, 1, 1.
- (d) Sketch scatter diagram for the following types :
  - (i) Perfect Positive Correlation,
  - (ii) Perfect Negative Correlation.
- (e) Calculate value of  $R_{2,13}$  when  
 $r_{12} = 0.6$ ,  $r_{13} = 0.7$ ,  $r_{23} = 0.65$ .

[3618]-7

1

P.T.O.

- (f) Compute Correlation Coefficient for the following data :  
 $n = 100$ ,  $\bar{x} = 62$ ,  $\bar{y} = 53$ ,  $\sigma_x = 10$ ,  $\sigma_y = 12$ ,  
 $\sum(x_i - 62)(y_i - 53) = 8,000$ .
- (g) Calculate Lower Quartile and Median for the following observations :  
 51, 52, 53, 51, 53, 54, 54, 50, 55, 53, 55, 56.
- (h) Distinguish between Seasonal Variation and Cyclic Variation.

**Q.2) Attempt any four of the following : [4x4=16]**

- (a) Construct stem and leaf diagram for the following observations :  
 87, 92, 95, 50, 45, 62, 70, 74, 76, 65, 54, 49, 40, 68, 82.
- (b) Explain scope of Statistics in Management Science.
- (c) The average weekly wages of labour in a tea garden is Rs. 1,250. If the average wages paid to the male labour is Rs. 1,400 while that paid to female labour is Rs. 1,000, find the ratio of male and female labours employed in the tea-garden.
- (d) State requisites of good measure of Central Tendency.
- (e) Define Raw and Central Moments for a Frequency Distribution. Also express Fourth Central Moment in terms of Raw Moments.
- (f) The Mean and Standard Deviation of 20 observations are 10 and 2 respectively. Later on it was noticed that value 8 was incorrect. Calculate Arithmetic Mean and Standard Deviation, if the wrong value is omitted.

**Q.3) Attempt any four of the following : [4x4=16]**

- (a) Explain the concept of Skewness of a Data Set. Discuss Karl Pearson's Coefficient of Skewness.
- (b) For a frequency distribution, Bowley's Coefficient of Skewness is 0.6. The sum of first and third quartiles is 100 and the median is 38. Find first and third quartile.
- (c) Explain the concept of Dispersion of a Data Set. Discuss utility of relative measures of Dispersion.

- (d) Information about the daily salaries of employees in firms A and B is stated below :

Firm	No. of Employees	Mean Salary in Rs.	S.D. of Salary
A	400	5,250	300
B	600	4,750	200

- (i) Which firm has smaller variation in salary ?
- (ii) Find Combined Mean and Combined Standard Deviation of the two firms.
- (e) Explain the concept of Kurtosis. Discuss types of Kurtosis with the help of suitable diagram.
- (f) For a frequency distribution, standard deviation is 3, find value of fourth central moment if distribution is (i) mesokurtic (ii) leptokurtic.

**Q.4) Attempt any two of the following :**

**[2x8=16]**

- (a) Explain the concept of correlation for a bivariate data. Comment on the statement "Correlation fails to measure non-linear relationship." Also compute rank correlation coefficient for the following data :

<b>Students</b>	1	2	3	4	5
<b>Marks in Accountancy</b>	45	70	65	30	90
<b>Marks in Statistics</b>	35	90	70	40	95

- (b) Write stepwise procedure to obtain equation of line of regression X on Y using method of least squares. The equations of two lines of regression obtained in a correlation analysis are as follows :

$$4x - 5y + 33 = 0$$

$$20x - 9y - 107 = 0$$

Calculate :

- (i) The mean values of X and Y.
- (ii) Coefficient of Correlation between X and Y.



- (c) Fit a second degree parabola to the following series of observations taking the year as the independent variable :

<b>Year</b>	1975	1976	1977	1978	1979
<b>Index of Jute Export Prices</b>	185	169	191	203	275

Also find estimate for the year 1980.

- (d) What is Time Series ? Discuss seasonal variation as a component of Time Series. Calculate five yearly moving average for the following data on daily sales of a shop :

<b>Day</b>	1	2	3	4	5	6	7	8	9	10
<b>Sales</b>	26	29	35	47	51	26	32	47	46	53

**Q.5) Attempt any two of the following :**

**[2x8=16]**

- (a) Explain the concept of multiple regression for a trivariate data. Write stepwise procedure for obtaining the equation of plane of regression of  $X_2$  on  $X_1$  and  $X_3$ .
- (b) In a trivariate distribution

$$\bar{X}_1 = 48.7, \bar{X}_2 = 59.8, \bar{X}_3 = 78,$$

$$\sigma_1 = 3.2, \sigma_2 = 5.4, \sigma_3 = 7.6,$$

$$r_{12} = 0.4, r_{13} = 0.6, r_{23} = 0.5$$

Find equation of regression plane of  $X_3$  on  $X_1$  and  $X_2$  and estimate value of  $X_3$  when  $X_1 = 30$  and  $X_2 = 47$ .

- (c) What is Control Chart ? Describe how R-Chart is useful in measuring quality of a product ? Twelve samples of size six each are drawn from the production process after every three hours and ranges for each of the twelve samples were as follows :

Sample No.	1	2	3	4	5	6	7	8	9	10	11	12
Mean ( $\bar{X}$ )	190	225	200	220	250	285	260	240	230	180	195	240
Range (R)	45	85	75	40	90	110	80	65	55	85	50	70

Draw  $\bar{X}$  chart to examine whether the process is under control.

- (d) Explain the concept of multiple correlation and partial correlation for a trivariate data. If  $r_{12} = r_{13} = r_{23} = r$ , ( $r \neq 1$ ), then show that :

$$(i) \quad R_{1.23}^2 = \frac{2r^2}{1+r}$$

$$(ii) \quad r_{12.3} = \frac{r}{1+r}$$

Total No. of Questions : 5]

[Total No. of Printed Pages : 4

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**F. Y. B. Sc. (Computer Science) Examination - 2009**

**ELECTRONICS**

**PAPER - II**

**FUNDAMENTALS OF DIGITAL ELECTRONICS**

**(June 2008 Pattern)**

**Time : 3 Hours]**

**[Max. Marks : 80**

***Instructions :***

- (1) All questions are compulsory.*
- (2) Use of non-programmable calculator is allowed.*
- (3) Draw neat diagrams wherever necessary.*

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**Q.1) Attempt the following :**

**[2x8=16]**

- (a) Convert :
  - (i)  $(54.24)_{10} = (?)_8$
  - (ii)  $(101111)_2 = (?)_{16}$
- (b) Draw logic symbols and write logic equations for two inputs :
  - (i) Inclusive OR Gate
  - (ii) Exclusive OR Gate
- (c) Draw logic circuit of half-adder.
- (d) A 4 bit PISO shift register has clock frequency 100 kHz. Find total time required to load and shift out entire data in the same mode.
- (e) Define Multivibrator. Mention number of quasistable states in Astable, Monostable and Bistable Multivibrator.

**[3618]-6**

**1**

**P.T.O.**

- (f) What are the advantages of Tristate Buffer ?
- (g) Define :
  - (i) Conversion Time
  - (ii) Resolution in case of ADC
- (h) Define :
  - (i) Assembler
  - (ii) Compiler

**Q.2) Attempt any four of the following : [4x4=16]**

- (a) Convert following hexadecimal numbers into BCD :
  - (i) E9A
  - (ii) F4B
- (b) What do you mean by Encoder ? Explain decimal to BCD encoder using OR Gates.
- (c) How SR Flip-flop can be converted into J-K Flip-flop ? Give truth table of J-K Flip-flop.
- (d) Draw internal block diagram of IC555. Give functions of each pin.
- (e) What is the full scale output voltage in a 4 bit R-2R DAC, if the input levels are 0 = 0 volt and 1 = 12 volt ? Hence find output when digital data is 0110.
- (f) List features of PIC Microcontroller.

**Q.3) Attempt any four of the following : [4x4=16]**

- (a) If  $A = 1100$  and  $B = 100$ , perform the following operations :
  - (i)  $A + B$
  - (ii)  $A - B$
  - (iii)  $A \times B$
  - (iv)  $A \div B$

- (b) Implement NAND Gate using X – OR Gate and AND Gate.
- (c) (i) Distinguish between Analog Multiplexer and Digital Multiplexer.
- (ii) Distinguish between Decoder and Demultiplexer.
- (d) Implement logic function using 3 to 8 line decoder :  
 $f(A, B, C) = \Sigma(1, 2, 5, 7)$
- (e) What are the advantages of Crystal Oscillator ? Draw circuit diagram of crystal oscillator using inverter.
- (f) Compare RISC and CISC Processor.

**Q.4)** Attempt **any two** of the following : **[8x2=16]**

- (a) (i) Draw logic diagram for 3 bit Flash ADC. List the advantages and disadvantages of Flash ADC.
- (ii) Construct Excess-3 Code and Gray Code for decimal 0 to 9.
- (b) (i) Prove the following using Boolean Laws only :  

$$(A + B)(A + \bar{B})(\bar{A} + C) = AC$$
- (ii) Design a logic circuit using K-map such that its output is '1' for the inputs given below :  
 (I) A = 0, B = 0, C = 0  
 (II) A = 0, B = 1, C = 0  
 (III) A = 0, B = 1, C = 1  
 and 0 for remaining input conditions.
- (c) (i) Draw a neat diagram of clocked master slave J-K Flip-flop using NAND Gates. Explain how race around condition gets eliminated.

- (ii) 4 synchronous counters with three J-K Flip-flops have the following conditions :

$$J_A = K_A + \overline{Q}_C$$

$$J_B = K_B = Q_A$$

$$J_C = Q_A \cdot Q_B$$

$$K_C = Q_C$$

Determine its modulus and count Sequence.

- (d) (i) Draw circuit diagram for  $4 \times 4$  diode matrix ROM using suitable decoder. What will be the size of memory address register and memory buffer register.
- (ii) Define following parameters :
- (I) Address Hold Time
  - (II) Access Time
  - (III) Data Hold Time
  - (IV) Memory Capacity

**Q.5) Attempt any one of the following :**

**[16x1=16]**

- (a) (i) Write truth table for Full Adder. Simplify for sum and carry using K-map. Draw simplified logic diagram.
- (ii) Draw block diagram of  $1k \times 4$  memory chip. How many memory chips will be required to construct the following memory using basic memory chips of  $1k \times 4$ .
- (I)  $1k \times 16$
  - (II)  $4k \times 4$
- Mention chip arrangement for these.
- (b) (i) Design a sequence generator using J-K Flip-flop for sequence 1001001.
- (ii) (I) Distinguish between Machine Level Language and Assembly Language.
- (II) List different processors in Intel 80XX Family. Mention features of ARM Microcontroller.

Total No. of Questions : 5]

[Total No. of Printed Pages : 4

**[3618]-5**

**F. Y. B. Sc. (Computer Science) Examination - 2009**

**ELECTRONICS**

**PAPER - I**

**ELECTRONIC DEVICES, CIRCUITS AND COMPUTER PERIPHERALS**

**(June 2008 Pattern)**

**Time : 3 Hours]**

**[Max. Marks : 80**

**Instructions :**

- (1) *All questions are compulsory.*
  - (2) *Use of non-programmable electronic calculator is allowed.*
  - (3) *Draw neat diagram wherever necessary.*
- 
- 

**Q.1) Attempt the following :**

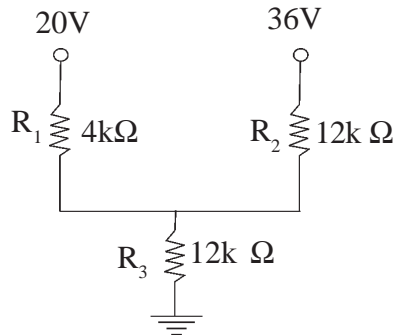
**[8x2=16]**

- (a) What are the features of an Ideal Constant Voltage Source ?
- (b) A decimal number '3' has to be displayed on a Seven Segment Display. Mention segments that should be ON.
- (c) Give two end points of DC Load Line.
- (d) Write any two applications of FET.
- (e) When negative feedback is applied to an amplifier of gain 100, overall gain falls to 50. Calculate Feedback Fraction.
- (f) State Barkhausen's Conditions for obtaining sustained oscillations.
- (g) Differentiate between Half Wave and Full Wave Rectifier.
- (h) Name circuits interfaced to the CPU on a Motherboard.

**Q.2)** Attempt **any four** of the following :

**[4x4=16]**

- (a) Explain action of n-p-n transistor.
- (b) Use Superposition Theorem to find voltage across  $R_3$  :

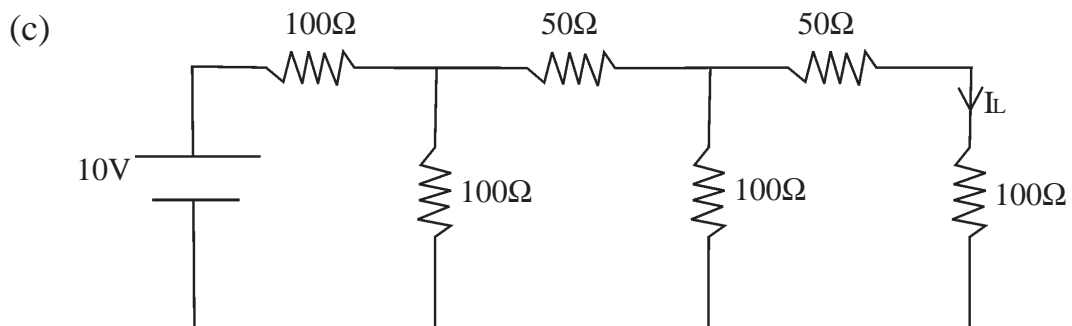


- (c) Define PIV of a Diode. Explain forward biased characteristics of rectifier diode.
- (d) Explain the concept of reading data from a CD.
- (e) Draw and explain working of a Phase Shift Oscillator using Operational Amplifier.
- (f) A transistor is connected in CE Configuration in which  $\alpha = 0.96$  and  $I_C = 0.625$  mA. Find value of  $\beta$  and  $I_B$ .

**Q.3)** Attempt **any four** of the following :

**[4x4=16]**

- (a) Explain working principle of n channel enhancement MOSFET.
- (b) Mention any four ideal characteristics of Operational Amplifier. Give their significance.



Find  $I_L$  using Thevenin's Theorem.



- (d) Explain operation of an Opto Coupler. What is the advantage of Opto Coupler ?
- (e) How can a BJT be used as a switch ?
- (f) What are the differences between BJT and FET ?

**Q.4) Attempt any two of the following : [2x8=16]**

- (a) How are amplifiers classified based on frequency response and Q point ? What is a Multistage Amplifier ? What is its purpose ? What is the overall gain of a five stage amplifier having gain of each stage as 20 ?
- (b) Explain working principles of Light Pen and Inkjet Printer.
- (c) With block diagram, explain working of Online and Offline UPS.
- (d) Define terms Pinchoff Voltage and Gate Source Cut-off Voltage of a FET. When  $V_{GS}$  of a FET changes from  $-3.1V$  to  $-3V$ , the drain current changes from  $1mA$  to  $1.3 mA$ . What is the value of Trans Conductance ?

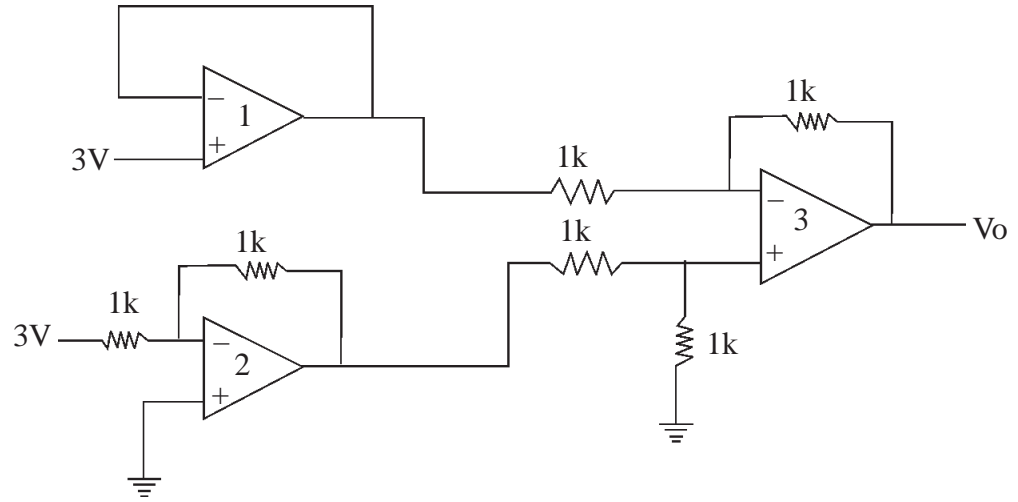
**Q.5) Attempt any one of the following : [1x16=16]**

- (a) (i) Explain electronics in using input devices - Keyboard and Mouse.
- (ii) Draw block diagram of Regulated Power Supply. Two power supplies A and B are available in the market. Power supply A has no load and full load voltages of  $30V$  and  $25V$  respectively whereas these values are  $30V$  and  $29V$  for power supply B. Which is a better power supply ?

**OR**

- (b) (i) Explain basic working principle of CRT and Plasma Display.

- (ii) In the following circuit, identify configuration of each operational amplifier. Also find output voltage for the circuit.



Total No. of Questions : 5]

[Total No. of Printed Pages : 4

[3618]-4

F. Y. B. Sc. (Computer Science) Examination - 2009

MATHEMATICS

PAPER - II

ALGEBRA AND CALCULUS

(June 2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

*Instructions :*

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

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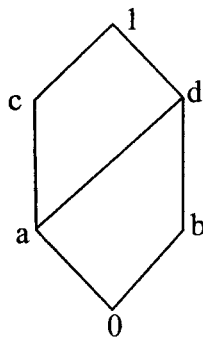
Q.1) Attempt **each** of the following :

[16]

(a) Let  $A = \{1, 2, 3\}$ , the relation  $R = A \times A$ .

Is  $R$  transitive ? Justify.

(b) Find a complement of the elements  $c$  and  $b$  in the following lattice :



(c) Draw a Hasse diagram for the relation 'divides' on

Set  $A = \{1, 3, 4, 8, 12, 24\}$ .

(d) Show that  $(53, 9999) = 1$ .

[3618]-4

1

P.T.O.

- (e) Evaluate limit of the following sequence :

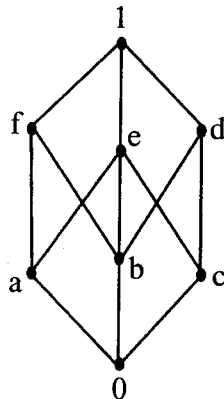
$$\langle x_n \rangle, \text{ where } x_n = \frac{n}{n+1} \forall n \in \mathbb{N}$$

- (f) Evaluate  $\lim_{n \rightarrow \infty} \left(1 + \frac{\pi}{3n}\right)^{-n}$
- (g) If  $y = \log(3 - 2x)$ , find  $y_n$ .
- (h) Give an example of real value function which is continuous but not differentiable at a point.

**Q.2) Attempt any four of the following :**

**[16]**

- (a) If  $R$  is the relation on set  $A = \{1, 2, 3, 4\}$  defined as 'xRy if and only if  $x \leq y$ ', then draw digraph of relation  $R$  and write the matrix of relation  $R$ .
- (b) Prove that for any two integers  $a$  and  $b$   $a \equiv b \pmod{n}$  if and only if  $a$  and  $b$  leave the same remainder when divided by  $n$ .
- (c) Find remainder of  $7^{486}$  when divided by 13.
- (d) Let  $S$  be set of students in a college in the academic year 2008–2009. Let  $R$  be the relation on  $S$ , defined as 'xRy if and only if  $x$  and  $y$  are classmates'. Is  $R$  an equivalence relation ?
- (e) Draw Hasse Diagram of  $D_{42}$  (the set of divisors of 42), with respect to partial ordering relation 'divides'.
- (f) Show that the following Hasse Diagram is not a lattice.



**Q.3)** Attempt **any four** of the following :

[16]

- (a) The sequence  $\{S_n\}$  is defined as  $S_1 = \frac{3}{2}$ ,  $S_{n+1} = 2 - \frac{1}{S_n} \forall n \geq 1$ .  
Prove that  $\{S_n\}$  is monotonic and bounded. Also, find limit of this sequence.
- (b) Prove that the series  $1 + \frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + \dots$  is convergent.
- (c) Let  $f(x) = e^{-|x|}$  for every  $x \in \mathbb{R}$ . Prove that it is continuous at  $x = 0$  but not differentiable at  $x = 0$ .
- (d) State and prove Cauchy's Mean Value Theorem.
- (e) Evaluate  $\lim_{x \rightarrow 0} \frac{\tan x - x}{x - \sin x}$ .
- (f) Obtain expansion of the function  $f(x) = e^{\sin x}$  by Maclaurin's Series.

**Q.4)** Attempt **any two** of the following :

[16]

- (a) If ' $\sim$ ' is an equivalence relation on set  $X$ , then prove that
- for every  $x \in X$ ,  $x \in \bar{x}$
  - for any  $x, y \in X$ ,  $x \in \bar{y}$  if and only if  $\bar{x} = \bar{y}$ .
  - for any  $x, y \in X$ , either  $\bar{x} = \bar{y}$  or  $\bar{x} \cap \bar{y} = \phi$ .
- (b) Find greatest common divisor  $d$  of 6162 and 1213. Hence find integers  $m$  and  $n$  such that  $d = 6162.m + 1213.n$ .
- (c) Using Warshall's Algorithm, obtain transitive closure of relation  $R$ , where
- $$R = \{(a, a) (a, c) (a, d) (b, a) (b, b) (c, b) (c, c), (d, a) (d, c) (d, d)\}$$
- on set
- $X = \{a, b, c, d\}$
- .
- (d) Write the Boolean Expression
- $$f(x, y, z) = (x \wedge y) \vee (\bar{x} \wedge z) \vee (\bar{y} \wedge z)$$
- in disjunctive normal form.

**Q.5) Attempt any two of the following :**

**[16]**

(a) State and prove Leibnitz's Theorem and hence find  $y_n$  for  $y = x^3 \cdot \sin x$ .

(b) If  $a < 1$ ,  $b < 1$  and  $b > a$ , then prove that

$$\frac{b - a}{\sqrt{1 - a^2}} < \sin^{-1} b - \sin^{-1} a < \frac{b - a}{\sqrt{1 - b^2}} \text{ and hence prove that}$$

$$\frac{\pi}{6} + \frac{1}{2\sqrt{3}} < \sin^{-1}\left(\frac{3}{4}\right) < \frac{\pi}{6} + \frac{1}{\sqrt{7}}$$

(c) State Taylor's Theorem with Lagrange's form of the remainder, also by assuming the validity of expansion, expand  $f(x) = e^x \cdot \cos x$  in ascending power of  $(x - \pi/4)$ .

(d) (i) Discuss convergence of the sequence 0.5, 0.55, 0.555,....

(ii) Discuss convergence of the series :

$$\sum \frac{\sqrt{n}}{7 + 9n^2}$$

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Total No. of Questions : 5]

[Total No. of Printed Pages : 6

[3618]-3

F. Y. B. Sc. (Computer Science) Examination - 2009

MATHEMATICS

PAPER - I

DISCRETE MATHEMATICS

(June 2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

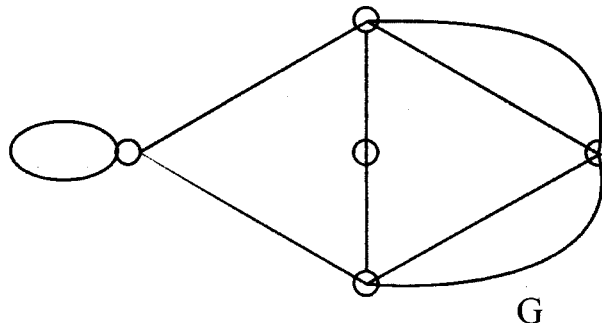
Instructions :

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

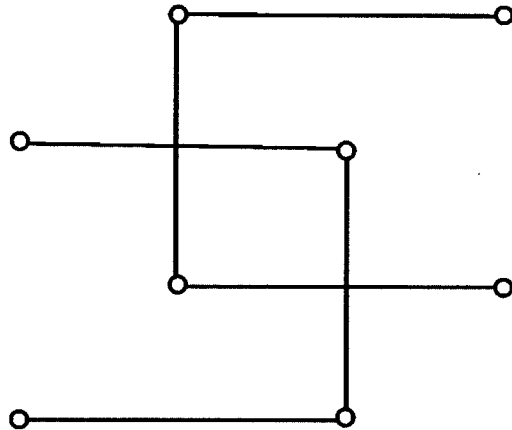
Q.1) Attempt each of the following :

[16]

- (a) A Bank Password consists of two letters of the English alphabet followed by one digit. How many different passwords are there ?
- (b) Find characteristic roots of the following recurrence relation :  
$$a_n - 6a_{n-1} + 11a_{n-2} - 6a_{n-3} = 0$$
- (c) Write contra-positive of the following statement :  
“If the flood destroys my house or the fire destroys my house, then my insurance company will pay me.”
- (d) Can a simple graph with 7 vertices, each of degree 3 exist ? Justify.
- (e) From the following graph G, draw any two spanning sub-graphs of G.



- (f) Is the following graph connected ? Also find number of components in it.



- (g) Draw any two simple directed graphs with 3 vertices.  
 (h) Define Quantifier.

**Q.2)** Attempt **any four** of the following :

[16]

- (a) Solve the following recurrence relation :  
 $a_n = a_{n-2} + 4 ; a_0 = 4, a_1 = 2.$
- (b) How many friends must you have, to guarantee that at least four of them will have birthdays in the same month ?
- (c) Using principle of Mathematical Induction, prove that  $x^n - y^n$  is divisible by  $x - y$ , for all  $n \geq 1$ .
- (d) Test validity of an argument :  
 $\sim d \vee \sim b, c, c \rightarrow d, a \rightarrow b \vdash \sim a$
- (e) Negate each of the following :
- $\forall x, \forall y (x + y + 2 = 0)$
  - $\exists x, \forall y (x > 0 \rightarrow x.y = 0)$
  - $\exists x, \forall y (x^2y < 0 \vee x = 2)$
  - $\forall x, \exists y (x + y \neq 10 \wedge xy - 3 = 0)$
- (f) Six boys and six girls are to be seated in a row. In how many ways can they be seated, if
- all boys are together.
  - no two girls are together.



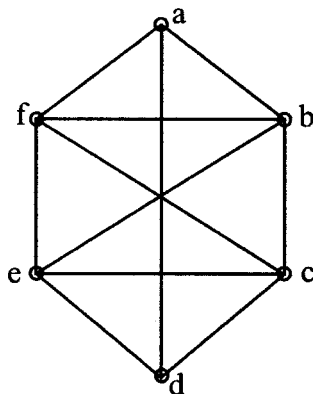
Q.3) Attempt any four of the following :

[16]

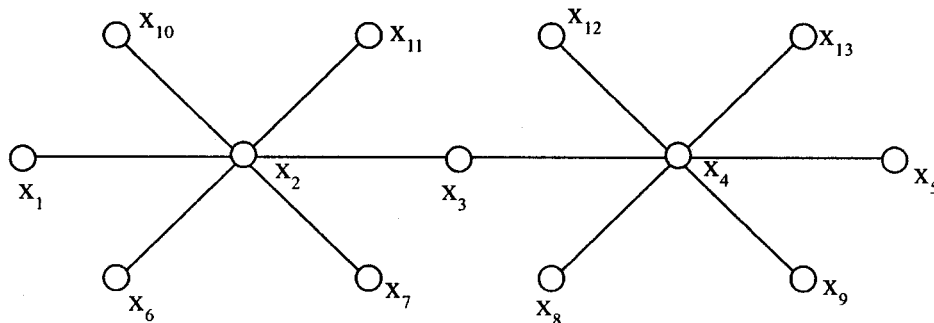
(a) Draw graph whose adjacency matrix is given below :

$$\begin{bmatrix} 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 \\ 1 & 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 \end{bmatrix}$$

(b) Find any two spanning trees of the following graph :

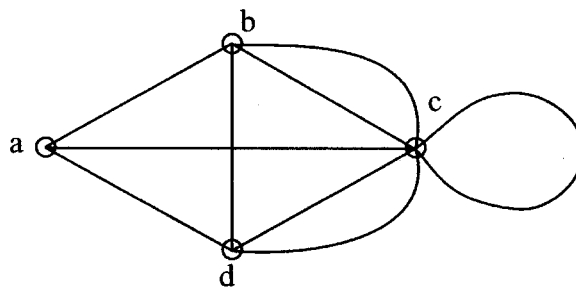


(c) Find eccentricity of each vertex in the following graph. Also find center and radius of a graph.



(d) Find complement of the graph  $K_{3,2}$ . Is it regular? Justify.

(e) Verify hand shaking lemma for the following graph :



- (f) Define the following :
- (i) Bipartite Graph
  - (ii) Regular Digraph
  - (iii) Underlying Graph
  - (iv) Isthmus

**Q.4)** Attempt any two of the following :

**[16]**

- (a) (i) Find a recurrence relation, for the number of ways to climb  $n$  stairs if the person climbing the stairs can take one stair or two stairs at a time.
- (ii) Define :
- (1) Time Complexity
  - (2) Big-oh of Function

- (b) Write an algorithm to sort an array by Insertion Method. Hence sort the given array :

13	32	28	81	17	99
----	----	----	----	----	----

- (c) State first principle of Mathematical Induction.

Also, if  $u_1 = 1$ ,  $u_2 = 5$  and  $u_{n+1} = 5u_n - 6u_{n-1}$  for  $n \geq 2$ , prove that  $u_n = 3^n - 2^n$  for all  $n \in \mathbb{N}$ .

- (d) (i) Give indirect proof of the following argument :

$$\sim r \vee \sim p, p \vee \sim q, q \vdash \sim r$$

- (ii) Express the following statements using quantifiers.

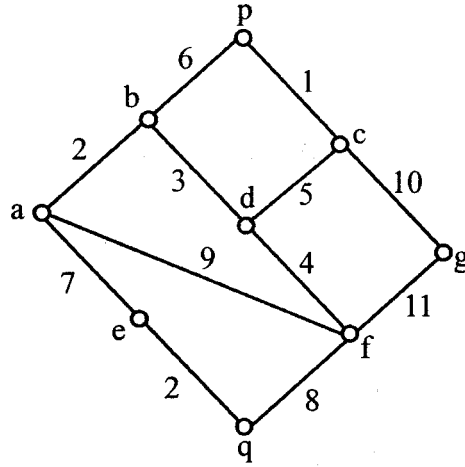
Also, find their negation.

- (1) Some drivers do not obey traffic rules.
- (2) Every bird can sing.

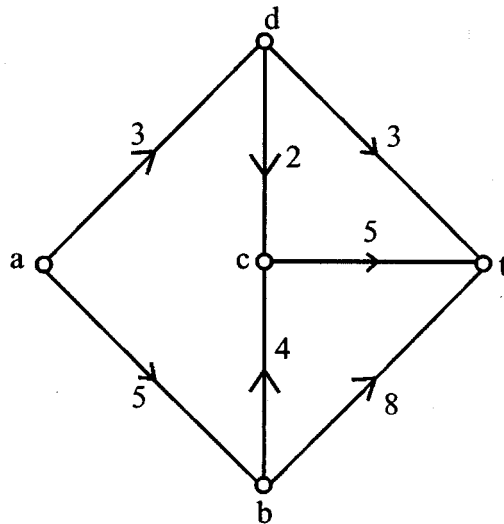
Q.5) Attempt **any two** of the following :

[16]

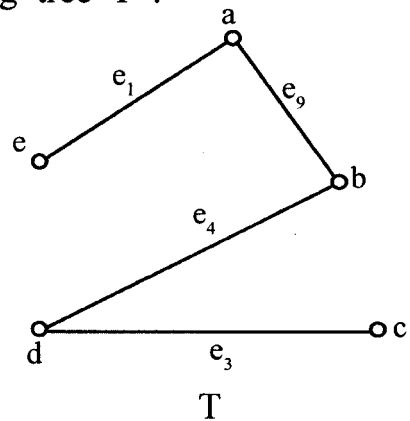
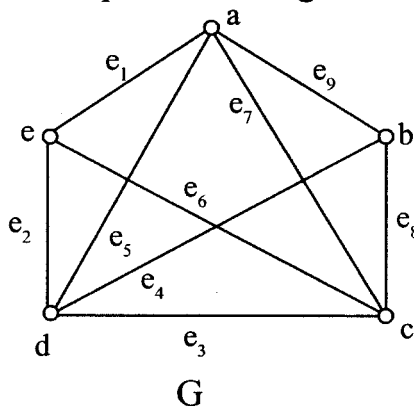
- (a) Using Dijkstra's Algorithm, find shortest path between the vertices p and q in the following graph :



- (b) Using Ford-Fulkerson Algorithm, determine maximal flow in the following network :



- (c) (i) Find all fundamental cutsets of the following graph G with respect to the given spanning tree T :



- (ii) Draw arborescence of the following expression and write it into polish notation :

$$(a \div b + 2) - (x + 2y)^8$$

- (d) (i) Prove that a tree with  $n$  vertices has  $(n - 1)$  edges.  
(ii) How many fundamental circuits of a connected graph with 12 vertices and 20 edges with respect to a spanning tree.

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Total No. of Questions : 5]

[Total No. of Printed Pages : 4

**[3618]-2**

**F. Y. B. Sc. (Computer Science) Examination - 2009**

**COMPUTER SCIENCE**

**PAPER - II**

**FILE ORGANISATION AND FUNDAMENTALS OF DATABASE**

**(June 2008 Pattern)**

**Time : 3 Hours]**

**[Max. Marks : 80**

**Instructions :**

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

**Q.1) Answer the following : (Any Ten)**

**[1x10=10]**

- (1) What is "DBMS" ?
- (2) Define Candidate Key.
- (3) What is Normalization.
- (4) Explain Outer Join.
- (5) Give any two consequences of a Bad Database Design.
- (6) Give any two functions of Database Administrator.
- (7) What is Tuples ?
- (8) Explain Projection from Relational Algebra.
- (9) What is Aggregation ?
- (10) Define 'DDL'.
- (11) Give an example of not-null constrain of SQL.
- (12) What is the role of naive users in Database ?

**Q.2) Answer the following : (Any Four)**

**[5x4=20]**

- (a) Explain difference between Primary and Secondary Index.
- (b) What is Hash File ? Explain Internal Hashing.
- (c) Differentiate between Specialization and Generalization.
- (d) What is meant by Data Model ? Explain any one type.

- (e) Consider the relation :
- $R = (A, B, C, D, E)$
- The set of functional dependencies is :
- $f = \{A \rightarrow BC, CD \rightarrow E, B \rightarrow D, E \rightarrow A\}$
- What is the Superkey for this relation ?

**Q.3) Answer the following : (Any Four) [5x4=20]**

- (a) Explain following commands with example :
- (i) Update
  - (ii) Alter
- (b) Explain Integrity Constraints.
- (c) What are the types of languages provided by 'DBMS' ?
- (d) What are the advantages of Normalization.
- (e) What are the different types of Operations that can be carried out on File Organisation ?

**Q.4) (A) Answer the following : (Any Three) [5x3=15]**

- (a) Consider the following relation :
- Game (gno, gname, no\_of\_player, coach\_name, captain)
- Player (pno, pname)
- Game and players are related with many\_to\_many relationship.
- Create a Relational Database for the above and convert it in 3NF and solve the following queries in SQL :
- (i) Count total no. of players whose coach name is 'Mr. Shah'.
  - (ii) List name of players playing Cricket and Hockey.
  - (iii) Display gamewise list of players.
- (b) Consider the following relation :
- Company (cid, cproduct, cname, region, state)
- Branches (bproduct, city) bid, bname)
- Company and branches are related with one-to-many relationship. Create a Relational Database for the above and convert it in 3NF and solve the following queries in SQL :
- (i) List all the cities having branch products 'CPU' and 'Keyboard'.
  - (ii) List all the states whose branch product is 'Hard Disk'.
  - (iii) Print citywise branches in descending order.

(c) Consider the following relation :

Doctor (docno, name, specialization)

Hospital (hospno, name, address)

Doctor and Hospitals are related with many-to-many relationship with attribute day-of-visit. Create a Relational Database in 3NF and solve the following queries in SQL :

- (i) List names of the Doctors visiting 'Sasoon Hospital'.
- (ii) Delete all Doctors with specialization 'Gynaec'.
- (iii) List name of Hospital in 'Ahmednagar' city which has more than Ten (10) Doctors of 'Surgeon' speciality visiting it.

(d) Consider the following relations :

Wholesaler (wno, wname, address, city)

Product (pno, pname)

Wholesaler and products are related with many-to-many relationship. Create a Relational Database in 3NF and solve the following queries in SQL :

- (i) List wholesalers of product 'Key board'.
- (ii) Count number of wholesalers from city 'Mumbai'.
- (iii) Delete records of wholesalers where product is 'Mouse'.

(B) Answer the following : (Any One)

[5x1=05]

(a) Consider the following relationships :

Employee (Ename, Street, City)

Works (Ename, Cname, Salary)

Company (Cname, City)

Solve queries in Relational Algebra :

- (i) Find names of Employees who work for 'Bank of India'.
- (ii) Give list of companies from 'Jalgaon'.

- (iii) Find list of Employees having salary more than 20,000.
  - (iv) Find names of cities of all employees who work for 'State Bank of India'.
  - (v) Find list of employees who work in the same city where they live.
- (b) Consider Relational Database :
- Supplier (sid, sname, sadd)
- Parts (pid, pname, colour, cost)
- Catalogue (sid, pid, colour)
- Solve queries in Relational Algebra :
- (i) Find names of suppliers, parts, colour, cost.
  - (ii) Find names of all parts whose cost is more than Rs. 50.
  - (iii) Find names of suppliers who supply 'Red' parts.
  - (iv) Find name of all parts whose colour is 'Blue'.
  - (v) List names of suppliers whose city is 'Pune'.

**Q.5) (A)** A database is being constructed to keep track of the teams and games of a sports league. A team has a number of players, not all of whom participate in each game. It is desired to keep track of the players and their participation in each game for each team, the position they played in that game and the result of game. Suggest a suitable information system to handle the above problem :

- (i) Draw Entity - Relation Diagram for the Information System Design.
- (ii) Convert Entity-Relation Diagram into Relational Database in 3NF. [07]

(B) What is Group by Clause ? Explain with example. [03]

**OR**

(B) What is Cartesian Product ? Explain with example. [03]



Total No. of Questions : 5]

[Total No. of Printed Pages : 4

**[3618]-1**

**F. Y. B. Sc. (Computer Science) Examination - 2009**

**COMPUTER SCIENCE**

**PAPER - I**

**INTRODUCTION TO PROGRAMMING AND 'C' PROGRAMMING**

**(June 2008 Pattern)**

**Time : 3 Hours]**

**[Max. Marks : 80**

**Instructions :**

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

**Q.1) Answer the following : (Any Ten)**

**[1x10=10]**

- (1) Where was 'C' developed and by whom ?
- (2) What are Source Program and Object Program ?
- (3) What is the precedence of 'C' Operators ?
- (4) What is the output of the following statement ?  

```
int i = 7;  
printf("%d %d %d", i, i++, ++i);
```
- (5) How are arrays usually processed in C ?
- (6) What is the ?: Operator ? Give example.
- (7) What are the rules that apply to expressions whose operands are different data types ?
- (8) What is Life Time of Variable ?
- (9) Define an enumeration type called flags, having the following members : first, second, third, fifth and sixth.
- (10) How can a pointer to constant objects be declared ?
- (11) What is the purpose of flags that are commonly used within the printf() function ?
- (12) What are Formal Parameters ?

**Q.2) Answer the following : (Any Four)**

**[5x4=20]**

- (a) Write a note on # define preprocessor directive.
- (b) What is Recursion ? Write a recursive function to display first n fibonacci numbers.
- (c) Write a note on Register Storage Class.
- (d) Explain Nesting of Structures. How can members of Nested Structures be accessed ?
- (e) What is the purpose of While Structure ? Explain execution of While Structure.

**Q.3) Answer the following : (Any Four)**

**[5x4=20]**

- (a) Write an algorithm and draw a flowchart to find largest from the given list of numbers.
- (b) Find and justify output of the following program segment :

```
int main( )
{
    int i = 3, j = 4, k, l;
    k = addmult(i, j);
    l = addmult(i, j);
    printf(“%d %d\n”, k, l); return 0;
}
int addmult(int ii, int jj)
{
    int kk, ll;
    kk = ii + jj;
    ll = ii + jj;
    return(kk + ll);
}
```

- (c) Find and justify output of the following program segment :

```
# include <stdio.h>

int main( )
{
    char str[20] = "Hello";
    char * const p = str;
    *p = 'M'
    printf("%s\n", str);
    return 0;
}
```

- (d) Find and justify output of the following program segment :

```
# include <stdio.h>

void main( )
{ char ch;
  int i, count, n = 4;
  for (i = 1; i <= n; i++)
  {
    for (count = 1, ch = 'A'; count <= i; count ++, ch++)
    printf("%c", ch);
    for (count = 1; count <= i - 1, count++, ch--)
    printf("%c", ch);
    printf("\n");
  }
}
```

(e) Complete the program :

```
void main()
{
    int a = 75, b = 735;
    void swap3 (int, int);
    printf("Before interchange a = %d, b = %d, a, b);
    swap3(a, b);
    printf("\n After interchange a = %d, b = %d", a, b);
}
```

**Q.4)** Answer the following : **(Any Four)**

**[5x4=20]**

- (a) Write a C program to calculate L.C.M. of two numbers.
- (b) Write a program for the following series :

$$y = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \dots$$

- (c) Write a program which accepts two numbers and displays all the perfect nos. between these two numbers by using function.
- (d) Write a C program to accept a decimal number and convert it into hexadecimal number.
- (e) Write a program to create a file which stores the following information :

Item\_name, quantity and price and read this information and display item name, quantity, price, amt.

**Q.5)** Answer the following : **(Any Two)**

**[5x2=10]**

- (a) What are the different types of Files ?
- (b) What are User Dified Function and Predefined Function ?
- (c) What are the different types of Integer Constants.