UNIVERSITY OF PUNE
[4363-164]
T.E. (Electrical) Examination-2013
Power Electronics
(2008 pattern)

Time-Three hours **Maximum Marks-100**
[Total No. of Question=12] **[Total no. of printed pages= 2]**
Instructions:

(1)Answer 3 questions from Section-I. Answer question 3 from Section-II,
(2)Answers to the two sections should be written in separate answer books.
(3)Neat diagrams must be drawn whenever necessary.
(4)Figures to the right indicate full marks.
(5)Assume suitable data wherever necessary.

SECTION-I

Q.1 (a)With the help of two transistor Analogy, explain latching characteristics of SCR. (8)
(b)What are various SCR triggering method?Explain the UJT triggering circuit for SCR. (8)

OR

Q.2 (a)Compare GTO construction with SCR. How turn off through gate is achieved in GTO? (8)
(b)What protections are used for over voltage.over current & thermal protection in Power circuits? (8)

Q.3 (a)Draw neat circuit for a 3 Ø semibridge rectifier feeding R-L load.Write the output voltage expression .The range of control for continuous conduction of current. (8)
(b)Explain what is meant by inversion mode of operation of a converter?Draw the control characteristic for 1 Ø.rectifier showing Rectification & inversion mode of operation. (8)

OR

Q.4 (a)Describe the concept of overlap in 3Ø.Rectifier showing Rectification & inversion mode of operation. (8)

(b)Calculate output voltage & current for a single phase full converter feeding R-L load with R= 10Ω & L=15 mH from single phase 230V,50 Hz ac supply at $\alpha = 60^0$ with continuous conduction of current. (8)

Q.5 (a)How thyristorised ac regulator can be used as two stage voltage controller?(9)

(b)Explain working of triac as a fan regular using neat circuit diagram. (9)

OR

Q.6 (a)Explain 4 quadrant operation of TRIAC using neat diagram. (9)
(b)Explain working of single phase ac regular feeding resistive load.Derive output voltage equation. (9)

SECTION-II

Q.7 (a)Draw and explain transfer characteristics of MOSFET and explain the terms
(i)Pinch off voltage
(ii)Threshold voltage
(iii)Transconductance (8)

(b)What are the gate drive requirements of MOSFET and IGBT? (8)

OR

Q.8 (a)Draw and explain transfer characteristics and output characteristic of IGBT What is SOA? (8)
(b)Explain switching characteristic of MCT. (8)

Q.9 (a)Explain principle of operation of step down chopper.with neat diagrams explain TRC and CLC techniques. (10)
(b)A step up chopper has input voltage 220 V and output voltage 660V.If the off time of chopper is 100μ s,compute pulse width of output voltage .In case pulse width is halved for constant frequency operation,find the new output voltage.(6)

OR

Q.10 (a)Explain working of type A chopper feeding RL load with help of neat circuit diagram.Draw the output voltage and current waveforms. Derive expression for average output voltage. (8)
(b)What is "Duty Cycle Control" of a chopper? How PWM and FM control is used? Compare. (8)

Q.11 (a)Explain working of single phase transistorised bridge inverter to supply variable voltage variable frequency output. How frequency can be controlled? Draw output voltage and current waveforms for inductive load. (9)
(b)What are the techniques used for control of harmonics in output voltage of 3 phase inverter?Explain. (9)

OR

Q.12 (a)Explain working of 3 phase VSI in 180^0 mode.Draw all waveforms and equivalent ckts.,for star connected resistive load. (10)
(b)Explain working of single phase full bridge inverter.Draw all waveforms.(8)

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T. E.(Electrical Engineering)Examination - 2013

ENGINEERING ECONOMICS & MANAGEMENT

(2008 Pattern)

[Total No. of Questions:] **[Total No. of Printed Pages :4]**

[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

*(1) Answers to the **two sections** should be written in **separate answer-books**.*

(2) Black figures to the right indicate full marks.

SECTION-I

UNIT-I

Q1 What do you mean by business organization? Explain various types of Business ownership with suitable examples. [16]

OR

Q2 a) Explain role & importance of Economics in the field of Engineering [8]

b) Explain the concept of Elasticity of Demand with diagram. [8]

UNIT-II

Q3 Explain meaning, scope, function and importance of management. State contribution of Henry Fayol & F.W. Taylor in the field of Management. [16]

OR

Q4 a) Explain the concept of just-in-time & six sigma briefly. [8]

b) State various types of plant layout used in industries. [8]

UNIT-3

Q5 a) Define marketing. Explain various functions of marketing. [9]

b) Write a brief note on online marketing. [9]

OR

Q6 a) Define financial management. State various types of costs. [9]

b) Explain the concept of Depreciation with the help of suitable examples. [9]

SECTION-II

UNIT-4

Q7 a) Define motivation. How motivation is important in todays context? Explain with the help of examples [8]

b) Explain Herzberg theory of motivation. [8]

OR

Q8 a) Define Entrepreneurship. Explain various traits of Entrepreneur. [8]

b) Explain qualities required for good leader. [8]

UNIT-5

Q9 a) Define Human resource management. Explain importance & scope of Human Resource management. [8]

b) Differentiate between Recruitment & Selection. [8]

OR

Q10 Write short notes (any two)

a) Job Satisfaction [4]

b) Time management [4]

c) Stress management [4]

d) Business Ethics [4]

UNIT-6

Q11 a) Explain the concept of Disaster Management in detail. [9]

b) State various Government machinery in India for disaster management. [9]

OR

Q12 Prepare a detailed Disaster Management Plan for Earthquake. [18]

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T. E. (ELECTRICAL)

Examination - 2013

MICRO-CONTROLLER AND APPLICATION

(2008 Pattern)

[Time : 3 Hours] **[Max. Marks : 100]**

Total No. of Questions : 12 **[Total No. of Printed Pages :4]**

Instructions :

(1) Answers to the ***two sections*** *should be written in* ***separate answer-books****.*

(2)Neat diagrams must be drawn wherever necessary.

(3)Black figures to the right indicate full marks.

(4)Your answer will be valued as a whole.

SECTION I

Q1) a) Explain salient features of MCS-51 family. **[6]**

b) Explain the structure of port 1 in 8051. **[6]**

c) Draw functional block diagram of 8051 and explain XTAL 1 and XTAL 2 pins. **[6]**

OR

Q2) a) Explain internal structure of I/O ports with neat sketch **[9]**

b) Explain general purpose registers and special function registers of 8051 microcontroller. **[9]**

Q3) a) Write a program is find smallest number in an array of seven numbers (stored in internal RAM location 40H onwards) and store result at 50H. **[8]**

b) Explain with example bit level logical instructions **[8]**

OR

Q4) a) Explain in detail various jump type instructions **[8]**

b) What is different between RET and RETI instructions? Explain why we use RETI instruction in ISR instead of RET instruction. **[8]**

Q5) a) Explain the importance of TFX bit in TCOM register of 8051. **[8]**

b) Draw and explain I2C. **[8]**

OR

Q6) a) Explain SCON and SBUF SFR's in detail **[8]**

b) Write a program to transmit letter 'P'to serial com port using 8051 at 9600 band rate (consider XTAL = 11.0592 MH_z) **[8]**

SECTION II

Q7) a) Explain the following development tools: **[18]**

(i) Simulator

(ii) Assemblers

(iii) Emulators

(iv) Cross Assembler

Q8) a) Discuss external memory interfacing with 8051 micro controller. Also discuss data memory and programme memory. **[9]**

b) Explain the role of 8255 in expanding I/O of 8051 micro controller. **[9]**

Q9) a) Write a programme to rotate stepper motor in clock wise direction using 8051 micro controller. **[8]**

b) Explain DAC and it's conversion methods. **[8]**

OR

Q10) a) Write a programme to measure temperature using 8051 **[8]**

b) Write a programme to generate triangular waveform using DAC. Also state EOC/SOC signals controlled using instructions. **[8]**

Q11) a) Discuss 4x4 key board interfacing with 8051 microcontroller. **[8]**

b) Draw and explain with a neat sketch for interfacing of 8051 to control DC motor. **[8]**

OR

Q12) a) Explain interfacing requirements in measurement of rms voltage using 8051 microcontroller. **[8]**

b) Write a short note of 16x2 LCD with its specifications and pin diagram. **[8]**

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T.E Electrical Examination - 2013

ELECTRICAL MACHINES-II

(2008 COURSE)

[Total No. of Questions :12] **[Total No. of Printed Pages :4]**

[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

*(1) Answer **three** question from each section.*

*(2) Answers to the **two sections** should be written in **separate answer-books**.*

(3) Black figures to the right indicate full marks.

(4) Neat diagrams must be drawn wherever necessary.

(5) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator is allowed.

(6) Assume suitable data, if necessary.

SECTION I

Q1 a) Define voltage regulation of alternator. Explain why Potier method gives more accurate results than synchronous impedance method. [6]

b) Compare salient pole & non salient type of alternators. [4]

c) A 1500 KVA, 6.6 KV 3 phase star connected alternator has effective armature resistance of 0.5 Ω/ph & synchronous reactance of 5Ω /ph. Find the voltage regulation at (i) unity pf (ii) 0.8 lagging pf. [8]

OR

Q2 a) What is armature reaction in case of three phase alternator? Explain its effect on the working of the alternator. [6]

b) Derive the expression for emf induced in case of a 3 phase alternator. [4]

c) A 1200 kvA, 3300 V, 50 Hz, 3-phase, star connected alternator has armature resistance of 0.25 Ωper phase. A field current of 40 A produces a short circuit current of 200 A and an open circuit emf of 1100 V line to line. Find the voltage regulation on (i) full load 0.8 pf lag (ii) full load 0.8 pf leading [8]

Q3 a) Explain the advantages of synchronizations of 3-phase alternators. Explain one dark & two bright lamp method for used for synchronizing of 3-phase alternator. [8]

b) The 11,000v, 3 phase star connected synchronize motor takes current of 60 Amp. The effective resistance & synchronize reactance per phase are respectively 1Ω and 30Ω. Find (1) the power supplied to the motor at 0.8 pf (2) induced emf for a power factor of 0.8 lead (3) induced emf for a power factor of 0.8 lagging [8]

OR

Q4 a) Explain operation & synchronize motor at [8]

1) Constant load & variable excitation

2) Constant excitation & variable load

b) A 3 phase alternator has direct axis synchronous reactance of 0.85 pu & quadrature axis synchronize reactance of 0.55 pu. Determine the load angle, the no load p.u. voltage & per unit voltage regulation for the alternator when operating on full load at 0.8 p.f lagging. [8]

Q5 a) State different methods of speed control of 3-phase Induction motor. Explain v/f method of speed control of 3-phase Induction motor [8]

b) Write a short note on 3 phase induction generator [8]

OR

Q6 a) Compare 3 phase induction motor with three phase synchronizes induction motor. [8]

b) Write a note on testing of 3-phase induction motor as per IS 325 & IS 402g [8]

SECTION-II

Q7 a) Explain the operation of d.c. series motor on a.c. supply and problems with a.c. operation. [8]

b) Draw the circle diagram of a plain series motor and explain? [8]

OR

Q8 a) Explain transformer and rotational e.m.f's in plain series motor. [8]

b) What are the types of compensated series motor? Describe each with circuit diagram. [8]

Q9 a) Explain with sketch the operation of brushless d.c. motor and the applications of it? [8]

b) Describe the working, characteristics and applications of permanent magnet stepper motor. [8]

OR

Q10 a) What are the types of harmonics and explain the remedies to reduce the harmonics? [8]

b) Explain the constructional features of variable reluctance type stepper motor. [8]

Q11 a) Draw the equivalent circuit of a single phase induction motor and discuss the experimental procedure to obtain its parameters. [8]

b) Explain the working principle and applications of single phase shaded pole motors. [4]

c) A 125W, 4 pole, 110V, 50Hz, single phase induction motor delivers rated output at a slip of 6%. The copper loss at full load is 25 Watts, calculate the full load efficiency & rotor copper loss caused by the backward field. Rotational losses may be assumed to be 25 Watts. Neglect stator copper loss. [6]

OR

Q12 a) Explain the cross field theory as applied to a single phase induction motor. [4]

b) What are the methods to make single phase induction motors self starting? Explain in detail with operation, characteristics. Characteristics of capacitor start motors. [6]

c) The constants of a 0.25 H.P., 230 V 4-pole, 60 Hz, single phase induction motor are as follows: [8]

stator resistance $R_1 = 10\Omega$

stator reactance $X_1 = 12.8\Omega$

Rotor resistance referred to stator $R_2^1 = 11.65\Omega$

Rotor reactance referred to stator $X_2^1 = 12.8\Omega$

Magnetising reactance $Xm = 258\Omega$

The total load is such that the machine runs at 3% slip, when the applied voltage is at 210V. The iron losses are 35.5 watts at 210 V. Calculate i) Input current ii) power developed iii) shaft power if mechanical losses are 7 watts. And iv) efficiency.

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T. E.(Electrical Engineering.)Examination May - 2013

ELECTRICAL INSTALLATION MAINTAINANCE & TESTING(303144)

(2008 Pattern)

[Total No. of Questions:12] **[Total No. of Printed Pages :3]**

[Time : 3 Hours] **[Max. Marks : 100]**

*(1) Answer **Q1 or Q2, Q3 or Q4, Q5 or Q6** from section I and **Q7 or Q8, Q9 or Q10, Q11 or Q12** from section II.*

*(2) Answers to the **two sections** should be written in **separate answer-books**.*

(3) Black figures to the right indicate full marks.

(4) Neat diagrams must be drawn wherever necessary.

(5) Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator is allowed.

(6) Assume suitable data, if necessary.

SECTION-I

Q1 a) Compare 3 phase 4 wire system on basis of volume requirement [8]
For conductor, on basis of equal maximum potential difference between any conductor and earth. Clearly state the assumptions.

b) Apply Kelvin's law to determine the economic cross-section for [8]
conductor of a 3 phase 10km long 33 K V overhead line. The line supplies load of 4MW at 0.8 power factor for 10hrs a day, 2MW at 0.88 power factor for 6hrs a day and 1MW at 0.88 power factor for 8hrs a day. The line is used for all 365 days in the year. The line cost can be taken as Rs.(85000+2000a) per km length, where 'a' is cross section in sq.mm. the resistance of aluminium conductor of length 1metre is 0.0286 Ohms and area 1 sqmm. Energy cost is Rs. 0.80 per KWH

OR

Q2 a) State and prove Kelvin's law for feeder design with reference to [8]
supply system. State limitations of Kelvin's law.

b) The load on 'R' phase of distributor are as under: [8]
i) 100A, 0.707 lagging power factor load at 100 Metre
ii) 120A, Unity power factor load at 250 Metre
iii) 80A, 0.8 lagging power factor at 400 Metre from feeding point. The resistance and inductive reactance per km length are 0.25Ohms and 0.125 Ohms respectively. Neglecting the voltage drop in neutral wire, find voltage across the load at the far end, if the voltage at feeding point is 240V.

Q3 a) Explain the various steps in design of earthing grid of substation with reference to IEEE Standard 80-2000 [8]

b) Explain necessity and types of earthing systems. [8]

OR

Q4 a) Draw layout of single busbar system station. State technical Specification of equipments used in substation. [8]

b) Define i) Step Potential ii) Touch Potential iii) Transferred Potential [8]

Q5 a) What are the different types of maintenance strategies? Explain Breakdown maintenance and planned maintenance. [10]

b) Define and Explain [8]
i) Polarisation Index
ii) Dielectric absorption Ratio.

OR

Q6 a) Explain planned and preventive maintenance of Induction Motor. [10]

b) Write a detail note on Condition Monitoring of electrical equipment. [8]

SECTION-II

Q7 a) Explain in detail contamination process of transformer oil. [6]

b) Explain the testing and condition monitoring of Transformer oil as per IS. Standards [10]

OR

Q8 a) Explain in detail various failure modes of transformer. [8]

b) Write a short note on condition monitoring of on load tap changer [8]

Q9 a) Explain 'tan δ ' measurement for condition monitoring of insulation. [8]

b) Enlist different causes for failure of power cables. What are different [8]

cable fault location methods?

OR

Q10 a) What is Signature Analysis? How it is useful for condition monitoring of electrical equipment? [8]

b) What is Thermography? Write any four advantages of it. How it is useful for condition monitoring of power transformer? [8]

Q11 Explain working, troubleshooting and electrical maintenance (any four points) of following appliances: i) Electric mixer ii) Microwave oven [18]

OR

Q12 Explain working, troubleshooting and electrical maintenance (any Four points) of following appliances: i) Electric fan ii) Refrigerator [18]

UNIVERSITY OF PUNE
[4363]-166
T. E.(Electrical Sem-II)Examination - 2013
POWER SYSTEMS-II
(2008 Pattern)

[Total No. of Questions:12] **[Total No. of Printed Pages :4]**
[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

*(1) Answer **Q1 or Q2, Q3 or Q4, Q5 or Q6** from section I and **Q7 or Q8, Q9 or Q10, Q11 or Q12** from section II.*
*(2) Answers to the **two sections** should be written in **separate answer-books**.*
(3) Black figures to the right indicate full marks.
(4) Neat diagrams must be drawn wherever necessary.
(5) Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator is allowed.
(6) Assume suitable data, if necessary.

SECTION-I

Q1 a) Derive receiving end active and reactive power flow equation using generalized constant [8]

b) A three-phase, 132kV overhead transmission line delivers 50MVA at 132kV and power factor 0.8 lagging at its receiving end. The constants of lines are A=0.98∠3° and B=110∠75°Ω/ph. Find following using analytical method [8]
a) Sending end voltage, active and reactive power
b) Losses and Reactive power absorbed by line

OR

Q2 a) What is the significance of receiving end circle diagram? Explain its Procedure in detail. [8]

b) Explain different types of compensation given to transmission line its significance. [8]

Q3 a) Explain corona phenomenon. Also explain disruptive critical voltage and visual critical voltage in association with corona. [8]

b) A power of 2000MW is required to be transmitted from super thermal power station in Central India over 800km to Delhi. Use 400kV and 750kV [8]

alternatives. The angle between sending and receiving end is maintained at 30°. The average line parameters are given below.

System voltage(kV)	400	750
r(Ω/phase/km)	0.031	0.0136
x(Ω/phase/km)	0.327	0.272

Suggest the number of circuits required and calculate total power loss and loss per km if transmission line is

i) Uncompensated ii) 50% series compensated using capacitor

OR

Q4 a) In three phase overhead line the conductors have each diameter of 30mm and are arranged in the form of an equilateral triangle. Assuming fair weather conditions air density factor is 0.95 and irregularity factor 0.95. Find the minimum spacing between the conductors if the disruptive critical voltage is not to exceed 230kV between lines. Breakdown strength of air may be assumed to be 30kV per cm(peak) [8]

b) Explain advantages of EHV-AC transmission. Also discuss its limitations. [8]

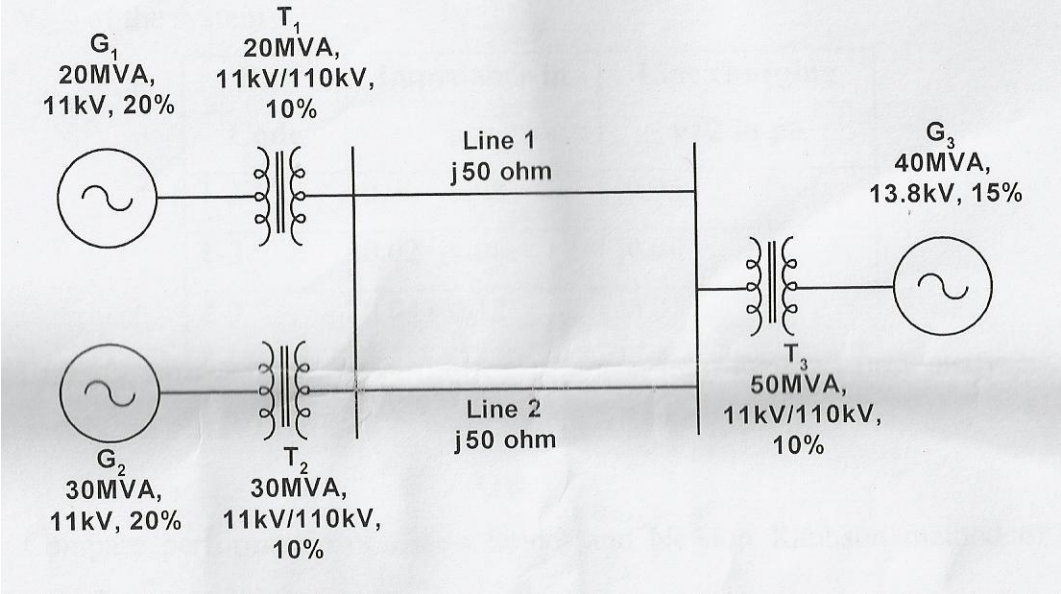
Q5 a) What are advantages and drawbacks of per unit system in power System analysis? [8]

b) Two 11kV, 3-phase 3MVA generators having sub transient reactance of 15% operate in parallel. The generators supply power to a transmission line through 6MVA transformer of ratio 11kV/22kV and having leakage reactance of 5%. Calculate fault current and fault MVA for three phase fault of (i) H.T. side (ii) L.T. side of transformer [10]

OR

Q6 a) Draw oscillogram diagram of symmetrical short circuit current and explain three phase short circuit at terminals of an unloaded alternator in detail. [8]

b) Represent the following power system in equivalent per unit diagram taking base of 20MVA, 11kV on generator G_1. [10]



SECTION-II

Q7 a) Three 6.6kV, 10MVA, 3-phase synchronous generators are connected to a common bus bar. Each machine has x_1=20%, x_2=15% and x_0=6%. If an L-G fault occurs on bus bar, determine fault current if [10]

i) All generator neutrals are solidly grounded. ii) One of the generators neutral is grounded through a resistance of 0.06 p.u. resistance and others are isolated.

b) Draw and explain zero-sequence network for various connection of three phase transformer. [8]

OR

Q8 a) Show that power in three phase circuit can be computed from symmetrical components of voltages and currents. [8]

b) A 15MVA, 6.9kV star connected generator has positive, negative sequence reactances are 25%, 25% and 8% respectively. A reactor with 6% reactance based on generator rating is used to ground the neutral of the generator. Calculate fault current in each phase in case of [10]

i) Line-to-Line fault ii) Double line to ground fault

Q9 a) In a three bus system the bus impedance data is given below. Determine Y_{BUS} of the system [8]

Bus Code	Impedance in p.u.	Line charging y/2 in pu
1-2	0.06+j0.08	j0.05
1-3	0.02+j0.06	j0.06
2-3	0.04+j0.12	j0.05

b) Classify various types of buses in a power system for load flow analysis. Justify the classification [8]

OR

Q10 a) Compare performance of Gauss Seidel and Newton Raphson method of load flow solution [8]

b) Derive static load flow equation for 'n' bus system [8]

Q11 a) Explain the advantages and disadvantages of HVDC transmission system in comparison with HVAC system [8]

b) Explain constant current control and constant ignition control in HVDC transmission system. [8]

OR

Q12 a) Draw single line diagram of HVDC transmission system indicating all components used in it. Also explain all components in detail. [8]

b) Explain different types of HVDC transmission system. Give the name of HVDC transmission line in Maharashtra with its type and specification. [8]

UNIVERSITY OF PUNE
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B. E. (ELECTRICAL) Examination 2013
ENERGY AUDIT AND MANAGEMENT
(2008 Course)

[Total No. of Questions:12] **[Total No. of Printed pages :2]**
[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

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

SECTION-I

Q.1a) List the strategies for better energy security of the nation. [8]
b) Give a brief summary of Indian & Global Energy Scenario. [8]

OR

Q.2a) Write a short note on Energy needs of growing economy. [8]
b) What is the concept of Green Building? [8]
Q.3a) Discuss in detail objectives & scope of Demand Side Management. [8]
b) Give the structure of Energy Management Cell in a Industry. [8]
What is the role of top management towards energy conservation?

OR

Q.4a) Define DSM, highlight the areas of development of DSM in commercial sector. [8]
b) Distinguish between duties of Energy Manager & Energy Auditor. [8]
Q.5a) Explain the following techniques with their use for energy analysis [8]
i) Pie-Chart ii) Least Square Method
b) Give the typical Energy Audit Report Format. [10]

OR

Q.6a) List various instruments & state their use in carrying out Energy Audit. [8]
b) Distinguish between Preliminary Energy Audit & Detailed Energy Audit. [10]

SECTION II

Q.7a) Write a short note on following. [8]

i) ABT Tariff

ii) TOD Tariff

b) Explain the following financial appraisal techniques. [8]

i) Net Present Value

ii) Internal Rate of Return

OR

Q.8a) Discuss the main objectives of carrying out sensitivity analysis. Also state the different factors that are considered for sensitivity analysis. [8]

b) Calculate simple payback period and % return on investment (ROI) for a project that cost Rs.90 Lakhs and Rs 8 Lakhs on an average to maintain and operate and is expected to save annually Rs. 20Lakhs. Comment on ROI whether to implement on the project. [8]

Q.9a) Explain various energy conservation opportunities in electrical power distribution system. [10]

b) Explain various Energy conservation options in commercial sectors. [8]

OR

Q.10a) Explain various energy conservation opportunities in pumping system. [10]

b) Explain in detail advantages and disadvantages of co-generation. [8]

Q.11a) Explain energy audit case studies in following sector with various energy saving opportunities: [16]

I) Paper and pulp industry

II) Textile industry

OR

Q.12 Explain energy audit case studies in following sector with various energy saving opportunities: [16]

I)Sugar industry

II) Steel industry

[Total No. of Questions: *12*] **[Total No. of Printed Pages:** *4*]

UNIVERSITY OF PUNE
[4363]-168
T.E. (Electrical) Examination - 2013
Utilization Of Electrical Energy
(2008 Course)(303147)

[Time: *3* **Hours]** **[Max. Marks: 100]**

Instructions:

1. ***Answer*** *three questions from section I and three questions from section II.*
2. *Answers to the* ***two sections*** *should be written in* ***separate answer-books****.*
3. *Neat diagrams must be drawn wherever necessary.*
4. *Assume suitable data, if necessary.*
5. *Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator is allowed*
6. *Black figures to the right indicate full marks.*

SECTION -I

Q.1 A The power required for dielectric heating of a slab of resin 150 cm^2 in area and 2cm thick is 220 watts, frequency of 32 MHz. The material has relative permittivity of 5 and pf of 0.06 Determine the voltage necessary and current flowing through the material. If the voltage is limited to 620V, what will be the value of the frequency to obtain the same heating? [8]

B Describe the construction and working of coreless induction furnace [8]

OR

Q.2 A Explain design procedure for a heating filament for resistance oven. [8]

	B	Describe the construction and working of Ajax Wyatt induction furnace.	[8]
Q.3	A	Explain the electrical circuit used in refrigerator.	[8]
	B	State the various applications of electrolytic process and write note on anodizing.	[8]

OR

Q. 4	A	Draw the electric circuit diagram of window air conditioner and explain it. Out of starting and running capacitor which is of greater value and why?	[8]
	B	Explain the factors on which quality of electro-deposition depends.	[8]
Q. 5	A	Define the following terms: i) Solid angle ii) Reflection factor iii) Coefficient of utilization iv) Luminous efficiency. State the units for these terms.	[8]
	B	A hall 30 m long and 12 m wide is to be illuminated and illumination required is 52 metre candles. Five types of lamps having outputs, as given below, are available: Watts 100 200 300 500 1000 Lumens 1600 3600 4800 10000 22000 Taking a depreciation factor of 1.3 and coefficient of utilization 0.5, calculate the number of lamps needed in each case to produce required illumination, Out of above five types of lamps select most suitable type design a suitable scheme and make a sketch showing location of lamps. Assume a suitable mounting	[10]

height and calculate space-height ratio of lamps.

OR

Q. 6	A	Compare incandescent and discharge lamp.	[10]
	B	Describe with neat sketches various types of electrical light fittings used for illumination.	[8]

SECTION II

Q. 7	A	Draw a general block diagram for electric locomotive and explain the function of each part.	[8]
	B	Explain the pantograph and bow collector.	[8]

OR

Q. 8	A	Compare steam engine drive with electrical drive.	[8]
	B	Describe single phase low frequency A.C system for track electrification with its merits and demerits.	[8]
Q. 9	A	Draw and explain the speed time curve for urban, suburban and main line service.	[8]
	B	An electric train has quadrilateral speed time curve with uniform acceleration from rest at 2 kmphps for 30 seconds, coasting for 50 seconds, braking period of 20 seconds. The train is moving a uniform down gradient of 1% tractive resistance 40 newtons per tone, rotational inertia effect 10% of dead weight, duration of stop 15 seconds and overall efficiency of transmission gear and motor as 75%. Calculate its schedule speed and specific energy consumption of run.	[10]

OR

Q. 10	A	Define the term specific energy consumption. Derive the expression for total energy output in watt hour for trapezoidal speed time curve.	[10]

	B	An electric train is to have acceleration and braking retardation of 0.8 kmphps and 3.2 kmphps respectively. If the ratio of maximum to average speed 1.3 and time for stop is 26 seconds. Find schedule speed for a run of 1.5 km. assume simplified trapezoidal speed time curve.	[8]
Q. 11	A	Explain with the energy how the energy is saved with series parallel starting in case of a locomotive engine using 4 motors for the operation	[8]
	B	Explain the suitability of DC series motor for traction service.	[8]
		OR	
Q. 12	A	Explain how regenerative braking is used in electric traction	[8]
	B	What is transition? State different methods of transition. Explain bridge transition	[8]

[Total No. of Questions: *12*] **[Total No. of Printed Pages: 6]**

UNIVERSITY OF PUNE
[4363]-169
T. E. (Electrical) Examination - 2013
DESIGN OF ELECTRICAL MACHINES
(2008 Course)(303148)

[Time: *3* **Hours]** **[Max. Marks: 100]**

Instructions:

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

SECTION -I

Q.1 A Explain the carter's fringe curve. And its applications [8]

B The hysteresis loss in a sample of iron was found to be 4.9 w/kg at a frequency of 50Hz and at a maximum flux density of 1.0 wb/m^2 i) calculate there from the coefficient η in the expression, loss per cycle $= \eta\ Bm^{1.7}$, J/m^3 the specific gravity of iron is 7.5 (ii) calculate the loss per kg at a frequency of 25 Hz and at a maximum flux density of 1.8 wb/m^2. [8]

OR

Q.2	A	Calculation of mmf in teeth is a complex problem. Explain why. What are the methods used to determine the mmf in teeth. Which method gives more accurate results why.	[8]
	B	Explain the various leakage fluxes produced in the rotating machines.	[8]
Q. 3	A	Define Heating time constant'. Draw the temperature rise curve and derive the equation for temperature rise at any time t, °c in terms of final steady temperature rise while heating and heating time constant.	[8]
	B	Derive the equation for the width of window which gives the maximum output of transformer. W_w=0.7d. Where W_w= Width of window and d= Diameter of Circumscribing circle.	[8]

OR

Q. 4	A	The temperature rise of a transformer is 25°c after one hour and 37.5^0C after two hours of starting from cold conditions. Calculate its final steady temperature rise and heating time constant. If its temperature falls from final steady value to 40°c in 1.5 hour when disconnected, calculate its cooling time constant the ambient temperature is 30°c	[8]
	B	Calculate the main dimensions of 100 kVA, 6.6/0.4KV frequency of 50Hz. Assume following data- voltage per turn =7.5 volts, Bm=1.2 wb/m^2, Ai/d^2=0.6, Hw/ww=2, Window space factor=0.28, current	[8]

density=2.5 A/mm^2.

Also determine the size of conductors and the number of turns in both the windings of transformer.

Q. 5	A	Explain why tappings are provided on h.v. winding transformer. Also explain following- i) Reference tappings ii) Negative tappings iii)Positive tappings.	[8]
	B	A 250 KVA,6.6/0.4KV, 3phase, core type transformer has a total loss of 4800w at fall load. The transformer tank is 125cm in height and 100cm ×50cm in plan. calculate the number of cooling tubes, it the average temperature rise is to be limited to 35°c The diameter of each tube is 5cm and the average height is 105 cm. the specific heat radiation =6w/ m^2/°c the specific heat dissipation due to convection= 6.5 w/m^2/°c. Assume convection is improved by 35% due to provision of cooling tubes.	[10]

OR

Q. 6	A	Explain why the distribution transformers are designed for high all day efficiency.	[6]
	B	List the assumptions making while deriving the equation for leakage reactance for 3-phase core type transformer.	[6]
	C	A 1MVA, 11000/3300v, three phase, delta-star transformer has-	[6]

i) Width of Hv = 68mm

ii) Width of Lv winding =17mm

iii) Height of both the windings = 594 mm

iv) Length of mean turn of the windings = 1165 mm

v)Width of duct between Lv and Hv windings =15 mm

vi) Number of turns on Lv winding =93

calculate the percentage reactance referred to Hv winding.

SECTION II

Q. 7	A	Explain the factors to be considered while selecting the value of specific electrical loading for the design A 3-phase induction motor.	[8]
	B	Determine the main dimensions, turns per phase, number of slots, conductor cross-section and slot area of a 250hp, 3-phase 50Hz, 400v, 1410 rpm slip ring induction motor, Assume Bav=0.5 wb/m^2, ac= 30,000A/m, efficiency =0.9 and power factor =0.9, winding factor =0.955, current density =3.5 A/mm^2. Slot space factor=0.4 and ratio L/τ=1.2. The machine is delta connected Assume 5 slots per pole per phase.	[10]

OR

Q. 8	A	Explain the factors which are to be considered while selecting the number of stator slots in an induction motor.	[6]
	B	Compare squirrel cage rotor with would rotor used in induction motors.	[6]
	C	Derive the equation for output in an induction motor.	[6]

Q. 9	A	Explain briefly how the number of slots in a cage rotor are decided to avoid crowling and cogging. What is the effect of skewing of slots.	[6]
	B	A 3-phase, 2-pole,50Hz squirrel cage induction motor has rotor diameter 0.20 m and core length 0.12 m The peak density in the air –gap is 0.55 wb/m^2. The rotor has 33 bars, each of resistance 125$\mu\Omega$ and leakage inductance 2μH. The slip is 6% Calculate (i) The peak value of current in each bar (ii) rotor I^2R loss (iii)rotor output and (iv)torque excerted. Neglect resistance of end rings.	[10]

OR

Q. 10	A	Derive the equation for end-ring current in an induction motor. Also show that end-ring current is also sinusoidal.	[5]
	B	Explain the methods which are used to eliminate the harmonic torques in an induction motor.	[3]
	C	A 90kw, 500v, 50Hz, 3-phase, 8-pole induction motor has a star connected stator winding accommodated in 63 slots with 6 conductors per slot. If the slip-ring voltages on open circuit is to be about 400v, find a suitable rotor winding, stating: i) Number of slots(ii)number of conductors per slot (iii)coil span (iv) slip ring voltage on open circuit (v)approximate full load current per phase in rotor. Assume efficiency=0.9, power factor= 0.86, slots per pole per phase = 3, rotor mmf is 86% of stator mmf.	[8]

Q. 11	A	What is dispersion coefficient. Explain its effect on overload capacity of the induction motor.	[8]
	B	A 75 kw, 3300v, 50Hz ,8-pole , 3phase star connected induction motor has a magnetizing current which is 35% of the full load current. Calculate the value of stator turns per phase it the mmf required for flux density at 30° from pole axis is 500A Assume winding factor=0.95, and full load efficiency and power factor 0.94 and 0.86 respectively.	[8]

OR

Q. 12	A	Explain the method of estimating magnetising current in an induction motor.	[6]
	B	Explain the effect dispersion coefficient on maximum power factor.	[6]
	C	Explain the effect of saturation of magnetic circuit on the performance of induction motor	[4]

[Total No. of Questions: 12] **[Total No. of Printed Pages: 4]**

UNIVERSITY OF PUNE
[4363]-170
T. E. (Electrical) Examination - 2013
Control System I (2008 Course) Sem II
[Time: 3 Hours] **[Max. Marks: 100]**

Instructions:

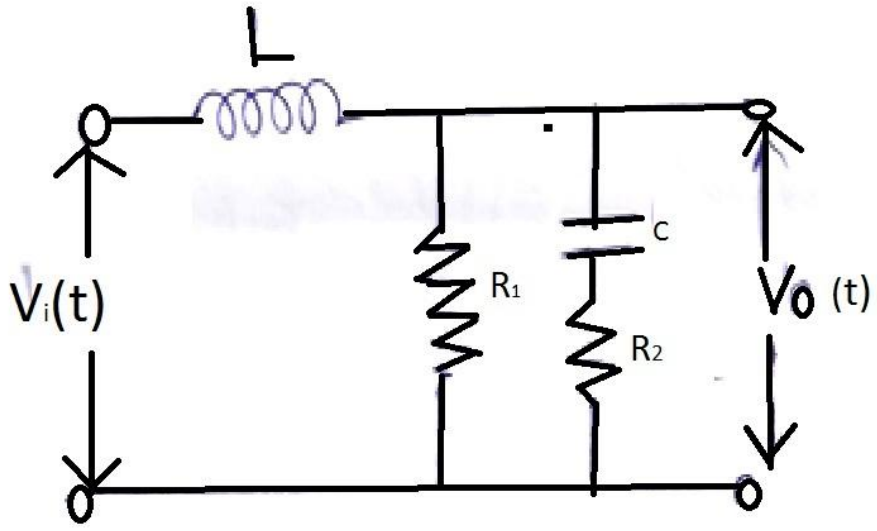
1 *Answer any three questions from each section.*
2 *Answers to the two sections should be written in separate answer-books.*
3 *Neat diagrams must be drawn wherever necessary.*
4 *Black figures to the right indicate full marks.*
5 *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
6 *Assume suitable data, if necessary.*

SECTION -I

UNIT I

Q.1 A Draw block diagram of closed loop control system. State function of each block. Also explain why negative feedback is commonly used. 8

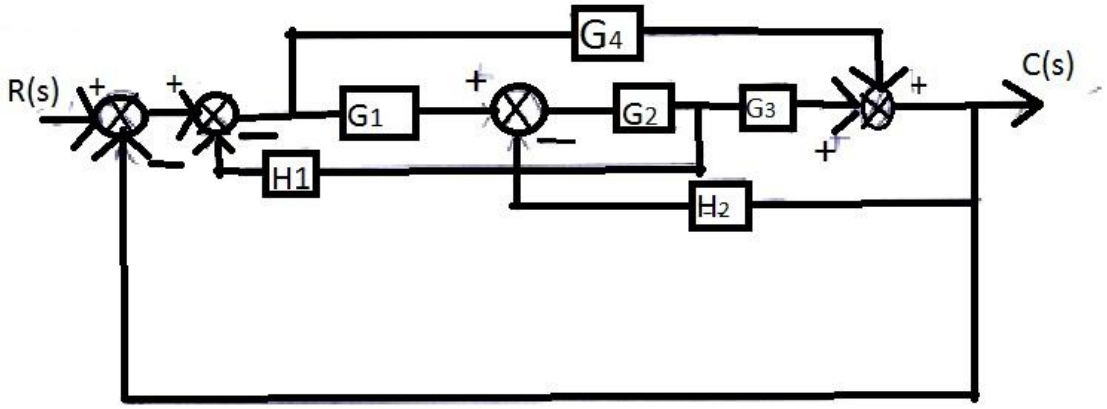
B Find the transfer function of electrical network shown below: 8



OR

Q.2 A Explain two types of electrical analogies for mechanical system. Also differentiate between them. 8

B Find the transfer function for the system shown in Fig. 2 using Mason's Gain Formula. 8



UNIT II

Q. 3 A Define type and order of the system. Identify type and order of following systems. 8

i) $\frac{k(s+1)}{s(s+3)(s^2+2s+2)}$

ii) $\frac{s(s+8)}{(s+4)(s+5)}$

iii) $\frac{k(s+3)}{(s+1)(s^2+4s+6)}$

B Explain the generalized error series method for determining the steady state error of a system. 8

OR

Q. 4 A Define transient response Explain with expressions all time domain specifications of second order system with step input. 8

B Determine time response specifications for $G(s)=\frac{10}{s^2+2s+6}$ with unity feedback. 8

UNIT III

Q. 5 A Explain the concept of absolute, relative and marginal stability. 6

B Sketch Root Locus for $G(s)=\frac{k}{s(s^2+6s+12)}$ with H(s)=1 8

C Explain the concept of Inverse root locus 4

OR

Q. 6	A	Explain Routh Huruietz Stability Criterion	4
	B	Apply Routh Huruietz Criterion to check the stability of system whose characteristic equation is $s^3+2.5\ s^2+20s+10k=0$. Find the range of k for which system is absolutely stable.	6
	C	Explain how to find the following terms during sketching of root locus i) Breakaway points ii) Asymptotes and centroid iii) Angle of arrival iv) Angle of departure	8

SECTION II

UNIT IV

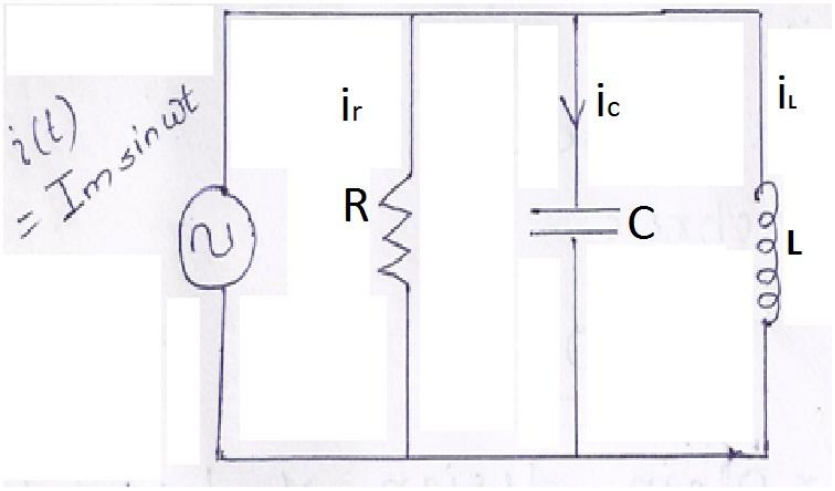
Q. 7	A	State advantages and disadvantages of frequency & time domain analysis.	8
	B	Determine frequency domain specifications for second order system with unity feedback and $G(s)=\frac{225}{s(s+6)}$	8

OR

Q. 8	A	A unity feedback control system has $G(s)=\frac{40}{s(s+2)(s+5)}$ Draw Bode plot. Find GM &PM.	8
	B	State and explain Nyquist Stability Criterion	8

UNIT V

Q. 9	A	Define the following terms: i) State ii) State variables iii) State vector iv) State space	4
`	B	State advantages and disadvantages of state space analysis.	4
	C	Obtain state model of the parallel RLC network shown in Fig3	10



OR

Q. 10 A Find cascade decomposition of transfer function 10

$$T(s) = \frac{s(s+2)}{(s+1)(s+3)(s+4)}$$

B Derive transfer function from state model. 8

UNIT VI

Q. 11 A Explain with neat block diagram 8

i) Series compensation

ii) Parallel compensation

B Write short notes on 8

i) Potentiometer

ii) Synchros

OR

Q. 12 A Explain design of Lag & Lead Compensator 8

B Draw block diagram and discuss 8

i) PD controller

ii) PI controller