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

P1258

[3564]-182

B.E. (Electrical)

ROBOTICS & AUTOMATION

(2003 Course) (Elective - I)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Your answers will be valued as a whole.***
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

Q1) a) Give RIA definition of a robot. Also state laws of robotics as stated by Issac Asimov. **[6]**

b) Recommend giving justification, the most suitable configuration of a robot for each of a robot for each of the following applications.

i) Assembly of small electrical motors.

ii) Spot welding.

iii) Servicing conveyor systems in circular work cells. **[10]**

OR

Q2) a) Explain the concept of CNC machine with the help of block diagram.**[8]**

b) What are the advantages and disadvantages of CNC machines over robots. **[8]**

Q3) a) Explain the concept of repeatability and accuracy and the difference between the two with the help of neat diagram. **[8]**

b) Discuss cartesian robot and articulated robot for the following points.**[10]**

i) Co-ordinate system.

ii) Work envelope (Draw Figure).

iii) Advantages & disadvantages.

iv) Applications.

OR

P.T.O.

Q4) a) Describe briefly the hydraulic axis-drive system used in a robot and explain its advantages and disadvantages over the electric drive system. **[6]**

b) Compare P.T.P. robot with C.P. robot. **[6]**

c) Compare servocontrolled robot with non-servocontrolled robots. **[6]**

Q5) a) Explain Lagrangian analysis for deriving dynamic equations of motion. **[8]**

b) Explain concepts of end effector, tool frame and tool point. Also define roll, pitch and yaw terms used in robotics. **[8]**

OR

Q6) a) Explain different methods of motion conversions from rotary to linear motion. **[8]**

b) A slender bar is moving as a pendulum. Use Lagrangian analysis to determine the torque developed by the motor driving the pendulum in terms of mass, length of the pendulum, its angular displacement, velocity and acceleration. **[8]**

SECTION - II

Q7) a) Explain the concept of homogeneous transformation matrix and significance of each column of that matrix. **[4]**

b) $$A = \begin{bmatrix} 0.5 & ? & 0 & 0 \\ 0.866 & ? & 0 & 0 \\ 0 & ? & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

The matrix A is a homogeneous transformation matrix. Find the missing terms marked by ? of the matrix. **[4]**

c) Derive the expression for rotational transformation matrix for rotation by an angle θ about Z axis using the principles of simple geometry. Hence find an expression for $\sin(\theta_1 + \theta_2)$ and $\cos(\theta_1 + \theta_2)$ when these are two consecutive rotations by an angle θ_1 and θ_2 about Z axis. **[10]**

OR

Q8) a) Draw a neat diagram showing D-H parameters and derive the expression for the D-H matrix which relates two consecutive co-ordinate frames. **[8]**

b) In a three axis RRR robotic arm, the shoulder joint is arranged on the axis of a rotary base and the axes of rotation of shoulder and elbow joints are parallel to each other. The D-H parameter table for the arm is given below.

Link	a	α	d	θ
1	0	90	0	θ_1
2	a_2	0	0	θ_2
3	a_3	0	0	θ_3

Draw the diagram showing the link co-ordinate system. Find the hand matrix for $\theta_1 = \theta_2 = \theta_3 = 0$. **[10]**

Q9) a) 'The inverse kinematics problem is more practical than the forward kinematics problem'. - Justify the statement. **[4]**

b) The 'A' matrices of a three RPR cylindrical co-ordinate robot are as follows **[12]**

$$A_{01} = \begin{bmatrix} C_1 & 0 & S_1 & 0 \\ S_1 & 0 & -C_1 & 0 \\ 0 & 1 & 0 & d_1 \\ 0 & 0 & 0 & 1 \end{bmatrix}; \quad A_{12} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & R \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$A_{23} = \begin{bmatrix} C_3 & -S_3 & 0 & 0 \\ S_3 & C_3 & 0 & 0 \\ 0 & 0 & 1 & T_o \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Where $C_1 = \cos\theta_1$, R - Prismatic joint variable

T_o = tool offset.

The manipulator can move in a plane parallel to the x-y plane of base reference axes and has no control over 3-dimension. Find the inverse solution for this manipulator.

OR

Q10) a) Explain the industrial applications of the robots in (I) part sorting and (II) nuclear power plants w.r.t. **[8]**

i) Type of the robot configuration.

ii) Selection of drive.

iii) Methods of control.

iv) Sensors used.

b) Explain in details, geometric approach for finding the inverse solution of a six axis robotic arm. **[8]**

Q11) a) Explain joint position control (JPC) with a help of neat block diagram. **[8]**

b) Derive an expression for a differential rotation rot (K, $d\theta$). What are the assumptions in the derivation? **[8]**

OR

Q12) State and explain any four methods of robot programming in details. **[16]**

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

P1136

[3564]-191

B.E. (Electrical)

HIGH VOLTAGE ENGINEERING

(2003 Course) (403150)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) What is ionization? Explain Townsend's current growth equation in presence of secondary processes? Derive Townsend's criterion for breakdown. **[6]**

b) What is Paschen's law? Explain significance of existence of a minimum sparking potential in Paschen's curve. **[5]**

c) In an experiment on a certain gas, it was found that steady state current is 7.5×10^{-8}A at 8 kV at a distance of 0.4 cm between the plane electrodes. Keeping field constant and reducing distance to 0.1 cm results in current of 7.5×10^{-9}A. Calculate Townsend's primary ionization coefficient α. **[5]**

OR

Q2) a) Describe breakdown in non-uniform fields and corona discharge. Explain the concept of positive corona and negative corona. **[10]**

b) Explain streamer theory of breakdown in gases. **[6]**

Q3) a) What are different theories to explain the breakdown in liquids? Explain any one theory to explain breakdown in liquid dielectrics. **[8]**

b) What is thermal breakdown in solid dielectrics? How is it more significant than other mechanisms? **[8]**

OR

Q4) a) What is a composite dielectric? Explain mechanisms of breakdown in composite dielectrics. **[8]**

P.T.O.

b) In an experiment for determining the breakdown strength of transformer oil, the following observations are made. Determine the relationship between the breakdown voltage and gap spacing for the transformer oil.

Gap Spacing (mm)	:	4	6	10	12
Voltage at breakdown (kV)	:	90	140	210	255

[8]

Q5) a) What is insulation coordination? Explain statistical method of insulation coordination. **[9]**

b) Explain with schematic diagram, the development process of lightning stroke between cloud and ground. **[9]**

OR

Q6) a) Explain main causes of overvoltage due to switching surges. Discuss various methods to overcome problems of switching surges in power system. **[9]**

b) Explain with illustrative example the correlation between withstand voltage level of solid insulating material and protective level of protection devices. **[9]**

SECTION - II

Q7) a) Explain following circuits used for generation of high d.c. voltage.

i) Voltage doubler circuit.

ii) Voltage multiplier circuit. **[12]**

b) Draw a neat sketch of a standard impulse wave. Explain specifications for standard lightning wave and tolerances. **[6]**

OR

Q8) a) Draw a schematic diagram of 3 stage cascade transformer used for generation of 1050 kV power frequency a.c. voltage. Explain operation of cascade transformer. **[10]**

b) Calculate wave front time and wave tail time of impulse wave, if a 12 stage impulse generator has 0.126 microfarad condensers. The wavefront resistance is 800 Ohm and wave tail resistance is 5000 Ohm. The load capacitance is 1000 Pico-Farad. **[8]**

Q9) a) Explain basic principle of operation of Hall Generator used for measurement of d.c. current. **[8]**

b) Discuss basic principle of operation of series capacitor peak voltmeter used for measurement of peak value of a.c. voltages. **[8]**

OR

Q10) a) Explain the effect of following factors on sparkover voltage of sphere gap unit.

i) nearby earthed object.

ii) atmospheric conditions and humidity.

iii) irradiation and

iv) polarity and rise time of voltage waveform. **[8]**

b) Draw a neat diagram of electrostatic voltmeter. Explain basic principle of operation of electrostatic voltmeter. **[8]**

Q11) a) Explain power frequency test and impulse test on insulators. **[8]**

b) Explain the following short circuit tests on circuit breaker.

i) Direct test.

ii) Synthetic test. **[8]**

OR

Q12) a) Explain impulse testing on transformer. **[8]**

b) Explain how radio interference voltage of high voltage apparatus is measured. **[8]**

Total No. of Questions : 12] **[Total No. of Pages : 2**

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[3564]-190
B.E. (Electrical)
VLSI DESIGN (Elective - II)
(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) Differentiate Mealy machine and Moore machine modelling with example. **[8]**

b) Draw truth table, waveforms and circuit of 3 bit Asynchronous mod-8 counter. **[8]**

OR

Q2) a) i) Explain Race-around condition of J-K flip-flop. **[4]**

ii) Draw 4 bit universal shift register. **[4]**

b) Implement '11' string detector.

Draw its state diagram, state transition table, circuit with Moore model & Mealy model. **[8]**

Q3) a) Write EDA tool design flow in detail. **[9]**

b) Define the terms:

i) Entity ii) Architecture

iii) Configuration iv) Component

also give one example of each. **[8]**

OR

Q4) a) Write down the VHDL code for 2 x 4 Decoder using

i) Structural Model. ii) Behavioral Model. **[8]**

b) Implement:

i) 8 : 1 Mux. ii) Mod 20 counter

using VHDL code. **[9]**

P.T.O.

Q5) a) What is package? Explain with suitable example. **[8]**

b) Explain configuration, its need also give example of it using VHDL code. **[9]**

OR

Q6) a) Explain various data-types & data-objects in VHDL. **[10]**

b) Explain concurrent statements & sequential statements in VHDL with example. **[7]**

SECTION - II

Q7) a) Implement basic gates using CMOS. **[6]**

b) Explain the constructional details of Enhancement MOSFET & Depletion MOSFET. **[10]**

OR

Q8) a) Define the terms w.r.t. CMOS

i) Propagation Delay. ii) Fan-in.

iii) Fan-out. iv) Noise Margin.

v) Power-dissipation vi) Figure of merit. **[6]**

b) Explain voltage transfer characteristics for CMOS inverter. **[10]**

Q9) a) Explain Architectural block diagram of PLA & explain its each block. **[10]**

b) Differentiate PLD, CPLD & FPGA. **[6]**

OR

Q10) a) Explain Architectural building block of FPGA. **[10]**

b) Explain standard parameters of Xilinx XC4000 family. **[6]**

Q11) a) Write a code and explain Barrel shifter. **[9]**

b) Write VHDL code and explain 8 x 8 RAM. **[9]**

OR

Q12) a) Develop VHDL code for ALU with Add, Sub, Inc, Dec & basic logical operations. **[9]**

b) Write down code for 8 bit binary to integer converter. **[9]**

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

P1134

[3564]-189

B.E. (Electrical)

DIGITAL CONTROL SYSTEMS

(2003 Course) (403149)

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

Instructions to the candidates:

1) ***Answer any one question from each pair of questions Q.1 & Q.2, Q.3 & Q.4, Q.5 & Q.6, Q.7 & Q.8, Q.9 & Q.10 and Q.11 & Q.12***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, electronic unprogrammable pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the advantages and limitations of Digital Control Systems? **[8]**

b) A system is defined by input-output relationship $y(n) = x(-n)$ **[8]**

State whether this system is

i) Static or dynamic?

ii) Linear or non linear?

iii) Causal or non causal?

iv) Time varient or time-invarient?

OR

Q2) a) Explain, with neat diagrams, the various standard discrete input test signals. **[6]**

b) For the given sequence $x(n) = \{4, -1, 5, -2, 2\}$ **[6]**

i) Delay the sequence by 2 samples,

ii) Compress the sequence by time scale 2,

iii) Attenuate the sequence by amplitude scale 2,

iv) Fold the sequence and advance by one sample.

c) Draw the symbol and Input-Output relationship for: **[4]**

i) Adder ii) Signal multiplier

iii) Unit delay block & iv) Unit advance block

P.T.O.

Q3) a) Draw a neat block diagram of digital position control scheme and explain the function of each block. **[8]**

b) Obtain the linear convolution sum by using mathematical equation of convolution sum. Given **[8]**

$x(n) = \{1, 1, 1, 1\}$ and $h(n) = \{1, 1, 1, 1\}$
$\uparrow$

OR

Q4) a) In Discrete - Time (DT) system, what is the term "convolution sum?" Explain various methods of its computation. **[8]**

b) Obtain Direct Form - I and II realization of a system described by **[8]**

$$y(n)-\frac{4}{3}y(n-1)+2y(n-2)=x(n)+4x(n-1).$$

Q5) a) Define z-transform. Discuss the criterion for convergence and region of convergence (ROC) for unit step function. **[8]**

b) Evaluate the z-transforms of the following functions from the first principle. **[10]**

i) $f(t)=\sin \omega t$

ii) $$X(s)=\frac{1}{s(s+1)}$$

OR

Q6) a) Discuss the important properties and theorems of z-transform. Give the proof of the "Initial Value Theorem". **[8]**

b) Evaluate the inverse z-transform of the; **[10]**

i) $F(z)=\frac{1}{1-1.5z^{-1}+0.5z^{-2}}$ by partial fraction expansion.

ii) $X(z)=\frac{z^3}{(z-1)(z+0.8)(z-0.5)}$ by Cauchy's Residue.

SECTION - II

Q7) a) Explain, mapping between the s-plane and z-plane. Discuss how constant σ lines (loci) in S-plane are mapped into z-plane. **[8]**

b) Characteristic equation of discrete time system is given by; **[8]**

$$P(z)=z^4-0.6z^3-0.81z^2+0.67z-0.12=0$$

Find the stability of this system by Jury's Test.

OR

Q8) a) Which are the different methods of evaluation of the state feed back gain matrix K = [K_1, K_2, --, K_n) and explain anyone method in details. **[8]**

b) Characteristic equation of a discrete time system is given by $F(z) = z^3 - 1.3z^2 - 0.08z + 0.24 = 0$. Find the stability of this system by Bilinear Transformation method & Routh's stability criterion. **[8]**

Q9) a) Derive the solution of a non-homogeneous state equation of a discrete-time system from first principles. **[8]**

b) Consider the matrix $G = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$. Find state Transition matrix by similarity Transformation method. **[9]**

OR

Q10) a) The Pulse Transfer function of a discrete time system is: **[9]**

$$\frac{Y(z)}{U(z)} = \frac{b_0 z^n + b_1 z^{n-1} + --- + b_n}{z^n + a_1 z^{n-1} + --- + a_n}$$

Explain its First Companion form, Second Companion form & Jordan form of state space representation.

b) Consider the system **[8]**

$x(K + 1) = Gx(K) + Hu(K)$ where

$$G = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix}; H = \begin{bmatrix} 1 \\ 1 \end{bmatrix};$$

Obtain state Transition matrix by z-transform method.

Q11) a) Explain clearly with neat diagrams, the direct, cascade and parallel decompositions of Discrete Time Pulse Transfer Function. **[9]**

b) Obtain Diagonalizing Matrix M and Jordan canonical form of state-space model: **[8]**

$$x(K+1) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -12 & -16 & -7 \end{bmatrix} x(K) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(K);$$

$$y(K) = \begin{bmatrix} 1 & 0 & 1 \end{bmatrix} x(K) .$$

OR

Q12) a) Explain the concept of controllability and observability in case of discrete time state space representation. Discuss the methods of determining these values. **[9]**

b) Determine the controllability and observability of the following DT system. **[8]**

$$y(\mathrm{K}) = \begin{bmatrix} 1 & 0 & 1 \end{bmatrix} x(\mathrm{K}) \ .$$

$$x(\mathrm{K}+1) = \begin{bmatrix} 0.1 & 0.1 & 0 \\ 0.3 & -0.1 & -0.2 \\ 0 & 0 & -0.3 \end{bmatrix} x(\mathrm{K}) + \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} u(\mathrm{K}),$$

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

P1133

[3564]-188

B.E. (Electrical)

SWITCHGEAR & PROTECTION

(2003 Course)

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

Instructions to the candidates:

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

SECTION - I

Q1) a) What is the meaning of 'Backup Protection'? Compare with main protection on various points with examples. **[8]**

b) What are essential qualities of protective relaying? **[8]**

OR

Q2) a) Compare the various protections given on the basis of principle of operation. **[8]**

i) Over current

ii) Directional over current

iii) Differential

iv) Distance.

b) What is time/P.S.M. curve? How it can be used to obtain the actual operation time of relay? **[8]**

Q3) a) Explain the current interruption phenomena in A.C. circuit breakers. **[8]**

b) What is meant by transient recovery voltage? What are the different parameters affecting the transient recovery voltage? How? **[10]**

OR

Q4) a) In a short circuit test on a three pole 132 kV circuit breaker, the following observations are made.

p.f. of fault is 0.5, recovery voltage is 0.8 times full line value, the breaking current is symmetrical, frequency of oscillations of restriking voltage is 17 kHz.

Assume neutral is grounded & fault is not grounded. Determine average RRRV. **[10]**

b) Explain the concept of current chopping of capacitive current **[8]**

Q5) a) What are the important characteristics or ratings that must be possessed by every high voltage a.c. circuit breaker. **[8]**

b) Explain the working and constructional features of Airbreak Circuit breaker. **[8]**

OR

Q6) Write short notes on Any two: **[16]**

a) Autoreclosing

b) GIS.

c) Advantages and disadvantages of VCB.

SECTION - II

Q7) a) What do you mean by incipient faults in a transformer? Draw a neat sketch of Buchholz Relay and explain its operation, installation, merits and limitations. **[7]**

b) A 11 kV, 3 phase alternator has full load rated current of 200 A. Reactance of armature winding is 15 percent. The differential protection system is set to operate on earth fault currents of more than 200 A. Find the neutral earthing resistance. Which gives earth fault protection to 90% of stator winding. **[9]**

OR

Q8) a) Explain the percentage differential protection of transformers. Also draw neat ckt diagram for the same. A 3 phase, 33/3.3 kV star/delta connected transformer is protected by differential protection. CT's on LT side have a ratio of 400/5. Determine the CT ratio on HT side. **[9]**

b) Prepare a list of various types of faults taking place in alternator in explain each. **[7]**

Q9) a) Explain the carrier current protection scheme for long transmission lines. Draw its block diagram and explain working. How the frequency is selected in power line carrier system. **[9]**

b) Explain 3 zone distance protection scheme for transmission lines with necessary sketches. **[7]**

OR

Q10) a) Explain the concept of distance relaying applied to protection of transmission lines. Compare Impedance relay, Reactance relay and Mho relay with reference to application and characteristics. **[8]**

b) Explain the effect of arc resistance and power swings on the performance of distance relays. **[8]**

Q11) a) What are the advantages of static relays over conventional electromechanical relays? Draw a neat sketch of block diagram of static relay and explain its working. **[8]**

b) What are the different sources of transient over voltages in static relays and how can these be protected? **[5]**

c) Explain why half cycle data window is preferred over the full cycle data window in numerical protective relaying. **[5]**

OR

Q12) Write short notes (on any three): **[18]**

a) Microprocessor based over current relay.

b) Principle of duality.

c) Removal of DC offset component from current signal.

d) Rationalised Haar Transform (RHT).

e) Sampling theorem.

Total No. of Questions : 12] **[Total No. of Pages : 2**

P1132

[3564]-186
B.E. (Electrical)
RESTRUCTURING AND DEREGULATION (Elective - I)
(2003 Course) (403143)

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

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain functions and roles played by the following players in the Indian Power sector:
- i) Planning Commission.
- ii) Central Electricity Authority (CEA).
- iii) Ministry of Power. **[8]**

b) Explain the roles played by utilities such as Genco, Tranco, Disco in the Indian Power sector after deregulation. **[8]**

OR

Q2) a) Explain main features of electricity act 2003. **[8]**

b) Explain key details of National Electricity Policy and National Tariff Policy. **[8]**

Q3) a) Explain following terms with examples:
- i) Capital cost.
- ii) Debt and equity.
- iii) Depreciation.
- iv) Fixed and variable costs. **[8]**

b) Explain the tariff setting philosophy with reference to following basic principles:
- i) Average cost of supply.
- ii) Embedded (Historical) cost of supply.
- iii) Long range marginal cost (LRMC). **[8]**

OR

Q4) a) Explain following economic methods to compare investment options with examples.
- i) Payback period.
- ii) Internal rate of return.
- iii) Net present value. **[8]**

P.T.O.

b) Explain different performance indices with reference to generation, transmission and distribution. **[8]**

Q5) a) Elaborate the role of Central Electricity Regulatory Commission (CERC) and State Electricity Regulatory Commission (SERC). **[9]**

b) State and explain different non price issues in regulation. **[9]**

OR

Q6) Explain following types of regulations:

a) Rate of return regulation.

b) Performance based regulation.

c) Incentive regulation.

d) Benchmarking or yardstick regulation. **[18]**

SECTION - II

Q7) a) Explain the following models in details:

i) Pool model.

ii) Pool and bilateral trades. **[8]**

b) Explain the California energy crisis after the electricity reforms. **[8]**

OR

Q8) a) Explain various ISO (Independent System Operator) models. **[8]**

b) Explain international experience of restructuring of power industry in Latin America and UK. **[8]**

Q9) a) Explain Integrated trading model in details. **[8]**

b) Explain retail access framework, competing retailers, metering and accounting issues. **[8]**

OR

Q10) a) State and explain features of electricity that constrain the trading arrangement. **[8]**

b) Compare Integrated trading model, Wheeling trading model and Decentralized trading model. **[8]**

Q11) a) Explain in details congestion issues and management. **[9]**

b) Explain and compare TRANSCO and ISO. **[9]**

OR

Q12) a) State and explain various methods of transmission pricing. **[9]**

b) Write a note on Availability based tariff (ABT). **[9]**

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

P1131

[3564]-185

B.E. (Electrical Engineering)

PROJECT MANAGEMENT

(2003 Course) (403143)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Figures to the right indicate full marks.***
3) ***Use of scientific calculator is permitted.***

SECTION - I

Q1) a) Explain the various characteristics of Project Management by giving suitable examples. **[8]**

b) Compare various forms of Project Organization. **[8]**

OR

Q2) a) Define Project. Explain the need for Project Management. **[8]**

b) How would you establish viability of a Project? **[8]**

Q3) a) "Correct estimation of the capital cost of a project is the foundation over which the edifice of financial appraisal stands". Explain with reference to components of capital cost of a project. **[10]**

b) What are the causes of project failures? **[6]**

OR

Q4) Write short notes on: **[16]**

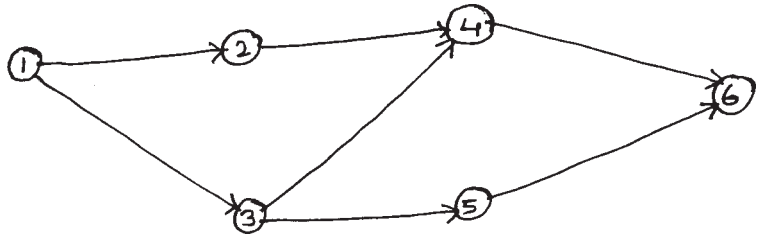
a) Various costs associated with project.

b) Allocation of Budgets.

c) Methods to workout ROI.

d) Project cost control.

Q5) A project has seven activities and the network diagram is as shown in the figure below. The normal time, crash time, normal cost, crash cost of all the activities are given. The fixed cost is Rs. 300/- per day. Establish the time cost relationship and find out the least cost duration of the project. **[18]**



P.T.O.

Activity	Normal Time (Days)	Normal Cost (Rs.)	Crash Time	Crash Cost (Rs.)
1-2	5	1000	4	1200
1-3	7	2100	5	2300
2-4	3	1500	2	1700
3-4	2	1300	2	1300
3-5	6	1200	4	1400
4-6	5	2000	4	2500
5-6	3	1500	2	1700

OR

Q6) Write short notes on: **[18]**

a) Gantt chart and its applications.

b) Resource Levelling.

c) AON Diagram.

SECTION - II

Q7) Write short notes on: **[16]**

a) Objectives and functions of Materials Management.

b) 5 R's of purchasing.

OR

Q8) a) Explain in detail purchase cycle. **[8]**

b) Explain various methods of buying. **[8]**

Q9) a) Explain the various types of inventories and the importance of safety stock. **[8]**

b) Bombay Builders (BB) buy ½ inch faucets from Keki Enterprises. The price schedule quoted by Keki is as follows.

Qty	Price per Unit (Rs.)
1 - 99	50.00
100 - 499	45.00
500 and above	40.00

BB estimate their annual requirement of these faucets as 2000. The ordering costs are estimated to be Rs. 25/- per order and the inventory carrying costs are charged at 30%. What is the optimal quantity to be ordered? **[8]**

OR

Q10) a) Explain what is meant by selective control of inventories. **[8]**

b) Explain functions of stores and point out the types of stores. **[8]**

Q11) a) Explain various methods of measuring risks. **[12]**

b) What are diversible and non-diversible risks? **[6]**

OR

Q12) a) An investment analyst foresees returns under 5 different possible scenarios as under

State of Economy	Probability of Occurrence	ROI
Strong Boom	0.20	35%
Mild Boom	0.15	20%
Average Economy	0.30	15%
Mild Recession	0.15	10%
Strong Recession	0.20	5%

Find the expected rate of return for the project. **[9]**

b) The expected cash inflows of a new project are estimated as under

Year	Cash inflow (Rs.)
1	1,50,000
2	2,50,000
3	3,50,000
4	2,50,000
5	2,00,000

The initial investment required for the project is Rs. 7,00,000/-. The risk adjusted discount rate is 12%. Evaluate if the project proposal is worthwhile. **[9]**

Total No. of Questions : 11] **[Total No. of Pages : 3**

P1130

[3564] - 180
B.E. (Electrical)
INDUSTRIAL DRIVES & CONTROL
(2003 Course)

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

Instructions to the candidates:

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***

SECTION - I

Q1) a) What is drive? Explain different types of drives and procedure for selecting it. **[8]**

b) A motor is used to drive a hoist. A motor characteristics are given by

Quadrants I, II & IV $T = 200 - 0.2N$ N–m

Quadrants II, III & IV $T = -200 - 0.2N$ N–m

where N is speed in rpm

when hoist is loades, the net load torque $T_l = 100$ N–M and when it is unloaded, net load torque $T_l = -80$ N–M obtain equilibrium speeds for operations in all four quadrants. **[8]**

OR

Q2) a) Derive fundamental torque equation of a drive along with it's dynamics. **[8]**

b) State essential parts of electrical drives what are the functions of each parts. **[8]**

Q3) a) Why braking is required for an electrical drive what are different types of braking. **[8]**

b) A 250V dc series motor drives a fan whose torque being proportional to the $1/5^{th}$ power of the speed. At a certain speed motor takes 40A. The machine resistance is 0.6Ω find the extra resistance to reduce the speed to 1/2 of original speed. **[8]**

OR

P.T.O.

Q4) a) Explain with neat circuit diagram and characteristic d.c. dynamic braking of 3 phase induction motor. **[8]**

b) What is regenerative braking. What are its advantages. How it is achieved in dc shunt motors. **[8]**

Q5) a) Explain with neat diagram of 3 phase fully controlled converter. How speed control is achieved. Draw output voltage waveform clearly showing switching instant for $\alpha = 30^{o}$ on it. Write o/p equation of converter. **[10]**

b) The speed of a 7.5 kW, 220V, 1200rpm separately excited d.c. motor is controlled by a single phase full converter. The rated armature current is 40A. The armature resistance Ra = 0.25Ω and La = 10mH. The a.c. source voltage is 265V. The motor voltage constant Kef = 0.18V/rpm. Assume the motor current is continuous and ripple free. For a firing angle of $\alpha = 30^{o}$ and the rated current determine the speed torque and power input to the motor. **[8]**

OR

Q6) a) Discuss the operation of a separately excited d.c. motor fed from a two quadrant d.c. chopper. Draw the power circuit diagram and wave forms of motor armature current, voltage under motoring and regenerative braking condition. **[10]**

b) What is dual converter? How it is used to drive d.c. motor? Explain different modes of operations and compare them. **[8]**

SECTION - II

Q7) a) Explain VSI controlled 3 phase I.M. with reference to stator voltage control and stator frequency control. **[8]**

b) A Three phase 1460 rpm, 415 V, 50Hz four pole star connected induction motor has the following parameters:

$r_1 = 0.65\Omega$, $r_2' = 0.35\Omega$, $x_1 = 0.95\Omega$, $X_2' = 1.43\Omega$ and $X_m = 28\Omega$ The speed of motor is controlled by varying the stator voltage and frequency. V/f ratio at the rated condition is kept constant. Determine the maximum torque and speed at which it occurs for stator frequencies of 50Hz, 25Hz. **[8]**

OR

Q8) a) State important features of d.c. link current source inverter. **[8]**

b) Explain different PWM technique, advantages of PWM control of inverter. **[8]**

Q9) a) Explain different classes of motor duty. **[6]**

b) A motor of smaller rating can be selected for short time duty why. **[4]**

c) Explain limitations of energy conservation in case of electric drives. **[6]**

OR

Q10) a) Explain thermal model of motor for heating and cooling. **[8]**

b) Explain factors for selection of electric drives. **[8]**

Q11) Write short notes on any three: **[18]**

a) Drives used in steel mills.

b) Drives in paper mills.

c) Drives in Electric traction.

d) Commutator less d.c. motor.

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

P1355

[3564] - 187
B.E. (Electrical)
ENERGY MANAGEMENT
(2003 Course) (403147)

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

Instructions to the candidates:

1) ***Answer 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
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

Q1) a) Explain salient features of Electricity Act 2003. **[8]**

b) Explain difference between Energy efficiency and conservation. **[8]**

OR

Q2) a) Explain important provisions of Energy conservation Act 2001. **[8]**

b) What do you mean by energy security? Explain few strategies to ensure energy security of our country. **[8]**

Q3) a) Explain various duties of Energy manager as per Energy conservation act 2001. **[6]**

b) Explain in detail impact of tariff on Energy Management. **[6]**

c) Explain concept of Energy Management. **[4]**

OR

Q4) a) Explain supply side and demand side management with advantages and disadvantages. **[8]**

b) Explain Energy Management strategies or various steps involved in Energy Management. **[8]**

P.T.O.

Q5) a) Explain energy audit its classification and stepwise procedure to conduct detailed energy audit. **[10]**

b) Explain sankey diagram and its use for energy analysis. **[8]**

OR

Q6) a) Explain CUSUM technique with stepwise procedure to draw CUSUM chart. **[9]**

b) Explain various instruments with function of each used to conduct energy audit. **[9]**

SECTION - II

Q7) a) Explain following financial analysis terms. **[8]**

i) Simple payback period.

ii) Return on Investment. (ROI).

iii) Internal Rate of return (IRR).

iv) Net present value (NPV).

b) Investment for an energy saving proposal is Rs. 17.00 lakhs, Annual saving for first four years is Rs. 1,32,000, Rs. 1,99,000, Rs. 3,10,000 and Rs. 4,50,000. Considering capital cost as 10% what is the net present value of the proposal. **[8]**

OR

Q8) a) Calculate simple payback period and % Return on Investment of a Energy conservation project costing Rs. 35 lakhs to purchase and Rs. 1.5 lakhs per year on an average to maintain and operate. The expected saving per annum is Rs. 17 lakhs. **[8]**

b) Explain various cost factors, various sources of capital and time value of money. **[8]**

Q9) a) Explain various Energy conservation opportunities in illumination. **[8]**

b) Explain concept of cogeneration with advantages. **[8]**

OR

Q10) a) Explain Energy conservation opportunities in motive power applications. **[8]**

b) Explain Energy conservation opportunities in HVAC. **[8]**

Q11) Explain Energy audit case studies of following organisations. **[18]**

a) T & D sector.

b) Muncipal Corporation.

OR

Q12) Explain Energy audit case studies of following industries. **[18]**

a) Chemical Industry.

b) Paper and pulp Industry.

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

P1354

[3564]-181
B.E. (Electrical)
CONTROL SYSTEMS - II
(2003 Revised Course)

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

Instructions to the candidates:

1) ***Answer any one question from each pair of questions Q.1 and Q.2, Q.3 and Q.4, Q.5 and Q.6, Q.7 and Q.8, Q.9 and Q.10, Q.11 and Q.12.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, non-programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define and explain the terms : **[8]**

i) State.
ii) State variables.
iii) State space.
iv) State equation.

b) Obtain the state model for system represented by **[8]**

$$\frac{d^3y}{dt^3}+6\frac{d^2y}{dt^2}+11\frac{dy}{dt}+10y=3\mathrm{U}(t)$$

Draw state diagram.

OR

Q2) a) Derive the relationship between transfer function and the state variable model representation. **[8]**

b) Obtain state model by direct decomposition method of a system whose transfer function is **[8]**

$$\frac{\mathrm{Y}(s)}{\mathrm{U}(s)}=\frac{5s^2+6s+8}{s^3+3s^2+7s+9}$$

Q3) a) Define and explain the terms **[8]**

i) Eigen values. ii) Eigen vector
iii) Modal Matrix. iv) Vander Monde Matrix. .

P.T.O.

b) Using Laplace transform method, find e^{At} for **[8]**

$$A=\begin{bmatrix}0 & -3\\ 1 & -4\end{bmatrix}$$

OR

Q4) a) Define State Transition Matrix and explain various methods to obtain STM from state equation **[8]**

$$\dot{X}=AX+BU$$

b) Using Cayley Hamilton method, find e^{At} for, **[8]**

$$A=\begin{bmatrix}0 & 1\\ -6 & -5\end{bmatrix}$$

Q5) a) Explain precisely the concept of controllability and observability applied to state space represented system. Discuss the methods of determining these values. **[9]**

b) Evaluate controllability and observability of the following state model,

$$A=\begin{bmatrix}-1 & 0 & 0\\ 0 & -2 & 0\\ 0 & 0 & -3\end{bmatrix}\quad B=\begin{bmatrix}1 & 0\\ 1 & 2\\ 2 & 1\end{bmatrix}\quad C=\begin{bmatrix}1 & 1 & 2\\ 3 & 1 & 5\end{bmatrix}$$ **[9]**

OR

Q6) a) What are different methods of evaluating state feedback gain matrix? Explain any one method in detail. **[9]**

b) Consider the system defined by **[9]**

$$\dot{X}=AX+BU$$

where

$$A=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -1 & -5 & -6\end{bmatrix}\quad B=\begin{bmatrix}0\\ 0\\ 1\end{bmatrix}$$

By using the state feedback control $u = -Kx$, it is desired to have the closed loop poles at $S = -1 \pm j1$, $S = -10$. Determine the state feedback gain matrix K.

SECTION - II

Q7) a) State different types of non linearities generally encountered in feedback control system. Give examples of each. **[8]**

b) In a unity feedback control system, an ideal relay is connected in series with linear transfer function **[9]**

$$G(s)=\frac{6}{s(s+2)(s+3)}$$

The output of the relay is ± 2. Derive the describing function N(*jw*) for the ideal relay and comment on the stability of the system.

OR

Q8) a) What is Describing Function? How stability of Non linear system is decided by using Describing Function technique? **[8]**

b) In a unity feedback control system a relay with dead zone is connected in cascade with **[9]**

$$G(s)=\frac{80}{s(s+1)(s+4)}$$

The relay has the dead zone of ± 1 unit and gives output of ± 2 units for input signal beyond the dead zone region. Using Describing function method determine the amplitude and frequency of limit cycle if it exists.

Q9) a) Explain with neat sketches - **[6]**

i) Stability.
ii) Asymptotic stability.
iii) Instability.
as per Liapunov.

b) Explain the terminologies used for scaler function **[4]**

i) Positive definite.
ii) Negative definite.
iii) Positive semidefinite.
iv) Negative semidefinite.

c) Determine the stability of a non linear system governed by the equations **[7]**

$$\dot{X}_1 = -x_1 + 2x_1^2 x_2$$
$$\dot{X}_2 = -x_2$$

OR

Q10) A unity feedback control system has the forward path transfer function **[17]**

$$G(s)=\frac{10}{s(s+4)}$$

in cascade with ideal relay whose output is ± 2 unit. For the unit step input, using the method of isoclines, construct the phase trajectory for at least one complete cycle in the $(e,\dot{e})$ plane.

From the phase trajectory determine the peak overshoot if it exists. Comment on the stability of the closed loop system.

Q11) Write short notes (any two)

a) Various types of actuators. **[8]**

b) Various types of sensors. **[8]**

c) Power transmitting techniques. **[8]**

OR

Q12) a) Write detailed note on Optimal Control design by calculus of variation method. **[8]**

b) What is 'Performance Index' as used in Optimal Control theory? Explain the following terms - **[8]**

i) ISE.
ii) ITAE.
iii) IAE.
iv) ITSE.

✷✷✷

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

P1138

[3564] - 193

B.E. (Electrical)

ANN & IT'S APPLICATION IN ELECTRICAL ENGINEERING

(2003 Course)

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

Instructions to the candidates:-

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

SECTION - I

Q1) a) What do you mean by knowledge based systems. **[6]**

b) List the different types of activation functions. **[5]**

c) Explain with diagram MC-Lock pitts model of Neural Network. **[5]**

OR

Q2) a) Write short notes on Fuzzification & defuzzi fication. **[8]**

b) Generate or function using Mc Culloch-Pitts neuron model. **[8]**

Q3) a) Realize a Hebb net for the AND function with bipolar inputs and targets. **[7]**

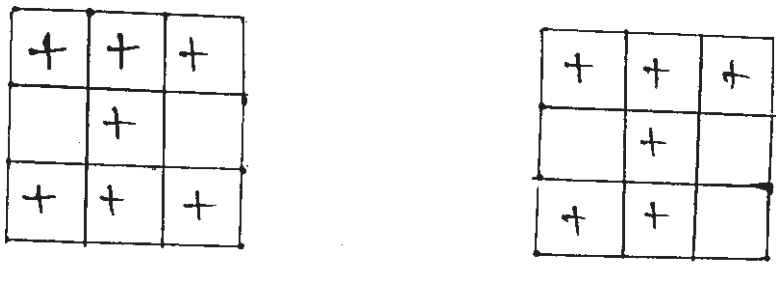
b) Discuss memory based learning in detail. **[6]**

c) Define linear separability. **[3]**

OR

P.T.O.

Q4) Classify the two dimensional input pattern given below using Hebb rule. **[16]**



I - J letter pattern

Q5) a) Develop a perceptron for the AND function with binary inputs and bipolar targets without bias upto 2 epochs. (take first with (0, 0) only). **[10]**

b) Write the perceptron training algorithm for several out put classes. **[8]**

OR

Q6) a) State the delta learning rule. Why is it called as least mean square rule? **[6]**

b) Derive the expression for extended delta learning rule. **[6]**

c) Explain Learning Rate Annealing techniques. **[6]**

SECTION - II

Q7) a) What is a feed forward network. **[6]**

b) Explain the architecture of a back propagation net. **[6]**

c) What is the activation function used in BPN. **[6]**

OR

Q8) a) How is error back propagated in a BPN. **[6]**

b) Write short note on the choice of the parameters used in a BPN? **[6]**

c) Difference between local minima & Global minima and give it's importance. **[6]**

Q9) a) Write short notes on the basic architecture and operation of ART network. **[8]**

b) State the Kohonen learning rule and write short notes on winner-takes all competition. **[8]**

OR

Q10) Construct and test LVQ with four vector assigned to two classes. Assume $\alpha = 0.1$ perform interraction upto $\alpha = 0.05$. **[16]**

Q11) Maharastra State Electricity Board decides to plan for the load forecasting for next six months. Give the load forecasting planning algorithm with your own consideration of generation, load of n feeders and frequency deviation. Apply ANN to solve this problem. (Assume n = 4) **[16]**

OR

Q12) Consider your any substation model with one incomming feeder as utility supply and say n outgoing feeders to supply the lood through sectionalizing switches and radial network. Give service resturation algorithm and apply any method of Neural Network to obtain appropriate results. **[16]**

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

P1137

[3564] - 192

B.E. (Electrical)

DIGITAL SIGNAL PROCESSING

(Elective - II) (2003 Course)

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

Instructions to the candidates:-

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compute correlation of the following sequences **[8]**

i) $x(n) = \{\underset{\uparrow}{1}, 2, 4\}$ and $h(n) = \{\underset{\uparrow}{1}, 1, 1, 1, 1\}$

ii) $x(n) = \{\underset{\uparrow}{1}, 2, 3, 4\}$ and $h(n) = \{\underset{\uparrow}{1}, 2, 3, 4, \}$

b) Explain standard discrete time signals. **[8]**

OR

Q2) a) Compare analog and digital signal processing. **[8]**

b) Compute linear convolution of **[8]**

$$x(n) = \left(\frac{1}{4}\right)^n u(n) \text{ and}$$

$$h(n) = \left(\frac{1}{3}\right)^n u(n)$$

where $0 \le n \le 5$ by tabulation method

P.T.O.

Q3) a) Explain the following properties of z-transform **[8]**

i) Initial value theorem.

ii) Convolution of two sequences.

b) Determine z-transform and ROC of signal **[8]**

i) $x(n) = (0.5)^n \left(\sin \frac{\pi n}{4} \right) u(n)$

ii) $x(n) = a^n \cos \text{won } u(n)$.

OR

Q4) a) What is pole-zero plot? How it can be described for z-transform. **[8]**

b) Find inverse z-transform of the following function using partial fraction

$$x(z) = \frac{z(z^2 - 4z + 6)}{(z-1)(z-2)(z-3)}$$ **[8]**

Q5) a) Determine circular convolution using DFT & IDFT **[10]**

$x_1(n) = \{\underset{\uparrow}{1}, 2, 3, 1\}$ and $x_2(n) = \{\underset{\uparrow}{4}, 3, 2, 2\}$

b) Explain Radix-2 DIF-FFT algorithm for computation of DFT when N = 8. **[8]**

OR

Q6) a) Explain the following properties of DFT **[10]**

i) Linearity

ii) Periodicity.

b) Find 4-point DFT of following sequence **[8]**

$x(n) = \sin(100\ \pi n)$ for $0 \le n \le 3$

SECTION - II

Q7) a) The transfer function of analog filter is **[8]**

$$H(s) = \frac{3}{(s+2)(s+3)}$$ with $T_s = 0.1$ sec

Design digital IIR Filter using BLT.

b) Determine direct form II realization for the following LTI system

$2y(n) + y(n-1) - 4y(n-3) = x(n) + 3x(n-1)$ **[5]**

c) Compare FIR filter with IIR filter **[5]**

OR

Q8) a) Explain design of IIR filter using impulse invariance method. **[8]**

b) Design FIR filter (lowpass) using rectangular window with passband gain of unity, cutoff frequency of 200Hz, sampling frequency of 1kHz. Assume length of impulse response as 07. **[10]**

Q9) a) Explain Harward and modified Harward architecture of DSP and compare. **[8]**

b) Explain architecture of TMS 320C5x. **[8]**

OR

Q10)a) For ADSP 21xx explain following : **[12]**

i) ALU.

ii) Multiplier Accumulator (MAC).

iii) Barrel Shifter.

iv) Data address generator (DAG).

b) What are desirable features of DSP processor. **[4]**

Q11)Write short notes on application of DSP for **[16]**

a) Variable frequency 3 phase induction motor drive.

b) Spectrum Analysis.

OR

Q12)a) How the power factor can be controlled using DSP. **[8]**

b) Explain following with DSP **[8]**

i) Vibration analysis.

ii) Harmonic analysis.

■■■■

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

P1129

[3564] - 179
B.E. (Electrical)
UTILISATION OF ELECTRICAL ENERGY
(403142) (2003 Course)

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

Instructions to the candidates:-

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

SECTION - I

Q1) a) Explain the various ways in which the temperature in resistance oven can be controlled. **[8]**

b) The power required for dielectric heating of a slab of resin 150 cm^2 in area and 2 cm thick is 200 watts frequency of 30 MHz. The material has a relative permittivity of 5 and p.f. 0.05. Determine the voltage necessary and current flowing through the material. If the voltage is limited to 600 V. What will be the value of the frequency to obtain the same heating. **[8]**

OR

Q2) a) What do you mean by Induction heating? Describe coreless Induction furnance. **[8]**

b) State how electric welding is classified. Differentiate between resistance welding and arc welding with reference to principle and application. **[8]**

Q3) a) What is electroplating and what for is it done? Describe the various operations involved in electro-plating. **[8]**

b) What are the application of electrolysis in metal working industry & explain any two applications in details. **[8]**

OR

P.T.O.

Q4) a) Draw electric circuit of refrigerator & explain its working. How can temperature inside the refrigerator be adjusted. **[8]**

b) What is meant by anodising? Explain the process of anodising and describe the equipment used for it. **[8]**

Q5) a) State and describe various types of lighting schemes. **[6]**

b) What are the requirement of good lighting? Explain in detail. **[6]**

c) Explain with a neat diagram the principle of operation of a sodium vapour lamp. Mention its use. **[6]**

OR

Q6) a) Describe with the help of a neat diagram the construction and working of a high pressure mercury vapour lamp. **[6]**

b) Enumerate the various factors to be considered while designing street lighting. **[6]**

c) The illumination of a drawing office 30 m × 10 m is to have a value of 250 lux and is to be provided by a number of 300 W filament lamps. If the utilisation factor is 0.4 and the depreciation factor is 0.9. Determine the number of lamps required. The efficiency of each lamp is 14 lumens per watt. **[6]**

SECTION - II

Q7) a) Draw a general block diagram for AC electric locomotive and explain it. **[8]**

b) Describe the various types of current collectors in common use for overhead contact system. **[8]**

OR

Q8) a) Explain the advantages and disadvantages of 1ϕ, 25kV ac system of track electrification over dc system. **[8]**

b) Describe in brief different systems of track electrification. **[8]**

Q9) a) What do you understand by speed-time curves? What is its use in practice? Draw the speed-time curves for urban and main line service. **[8]**

b) A train weighing 120 tonnes is to be driven up an incline of 2 percent at a speed of 36 kmph. If the train resistance at this speed is 2kg per tonne, find the current required at 1500 V dc. If efficiency of the motors and gearing is 88% if current were cut off, how long would the train take to come to rest. **[8]**

OR

Q10)a) Derive expression for simplified speed time curve in urban service. **[8]**

b) A suburban electric train has a maximum speed of 70 kmph. The schedule speed including a station stop of 30 seconds is 45 kmph. If the acceleration is 1.5 kmphps, find the value of retardation when the average distance between stops is 4 km. **[8]**

Q11)a) Explain with the energy diagram how the energy is saved with series parallel starting in case of a locomotive engine using 4 motors & 6 motors for the operation. **[10]**

b) Compare shunt transition and bridge transition. **[8]**

OR

Q12)a) State the mechanical and electrical features of electric traction motors. **[6]**

b) Discuss the suitability of dc series motor for traction duties. **[6]**

c) Explain in detail, the various methods of electric braking. **[6]**

■■■■

Total No. of Questions : 12] **[Total No. of Pages : 2**

P1282

[3564]-184
B.E. (Electrical)
ILLUMINATION ENGINEERING (403143)
(2003 Course) (Elective - I)

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 books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the effect of bad lighting? Explain perfect level of illumination. **[8]**

b) Explain various methods of controlling artificial lighting. **[8]**

OR

Q2) a) What are the methods of measurement of light? Explain any one in detail. **[8]**

b) Explain in brief production of light. **[8]**

Q3) a) What are the various types of Tungsten filament lamp? Explain one with sketch. **[9]**

b) What are the various types of Discharge lamps? Explain Flourscent lamp with sketch. **[9]**

OR

Q4) Explain any three with sketch. **[3×6]**

a) LED's

b) Metal Halide Lamps.

c) C.F.L.

d) LASERS.

Q5) a) Explain electrical control by using ballast of mercury vapour lamp. **[8]**

b) Explain starting gear and dimming for sodium vapour lamp. **[8]**

P.T.O.

OR

Q6) a) What are the types of lighting fixtures according to installation type. **[8]**

b) Explain in detail use of reflectors and refractors. **[8]**

SECTION - II

Q7) a) What are the various factors of good lighting scheme design. **[8]**

b) Explain C.O.U. (Coefficient of Utilization) in lighting scheme design with example. **[8]**

OR

Q8) a) Explain indoor lighting design using beam angles and polar diagram. **[8]**

b) Design good lighting scheme for educational facility. **[8]**

Q9) a) Design street lighting scheme using zonal flux for area lighting. **[9]**

b) Compare different light sources. **[9]**

OR

Q10)a) Explain payback calculation and life cycle costing. **[9]**

b) What are the various problems while designing energy efficient lighting scheme. **[9]**

Q11)a) Explain photovoltaic lighting. **[8]**

b) Write notes on Emergency lighting scheme as i) Central systems ii) Stand alone systems. **[8]**

OR

Q12)a) Explain methods of generation and concept of cold lighting. **[8]**

b) Write notes on switching control for lighting. **[8]**

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

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B.E. (Electrical)

Power System Operation and Control (403141)

(2003 Course)

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

Instructions :

1) ***Answer Three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) Explain the terms: **[9]**

i) Steady state stability.

ii) Transient stability.

iii) Dynamic stability.

b) Explain the equal area criterion used for analysis of power system stability. **[7]**

OR

Q2) a) State and derive the swing equation. **[8]**

b) Discuss the solution of swing equation by point by point method. **[8]**

Q3) a) What is meant by Unit Commitment Problem? In which generating unit it is important and where it is not important. Enlist various constraints in Unit Commitment Problem. **[9]**

b) Define spinning reserve. **[3]**

c) Discuss thermal unit constraints. **[4]**

OR

Q4) a) What are the methods for the solution of the Unit Commitment problem? Discuss dynamic programming method. **[10]**

b) Discuss hydro contraints. **[6]**

P.T.O.

Q5) a) Draw a complete block diagram representation of load frequency control of an isolated power system. Explain function of each block. **[9]**

b) Draw steady state load frequency characteristics of a speed governor system at (i) 100 % load (ii) 60 % load. Discuss the steady state changes in frequency caused by changes in load demand. **[9]**

OR

Q6) a) A 100 MVA synchronous generator operates on full load at a frequency of 50Hz. The load is suddenly reduced to 50 MW. Due to time lag in governor system, the steam valve begins to close after 0.4 seconds. Determine the change in frequency that occurs in this time.
Given H = 5 kW-sec/kV A of generator capacity. **[10]**

b) Discuss the effect of speed governor dead band on automatic generation control. **[8]**

SECTION - II

Q7) a) Discuss the real time data processing using state estimation. **[8]**

b) Explain real time monitoring of power system. **[8]**

OR

Q8) With reference to energy control centres discuss: **[16]**

a) Centralized and decentralized control.

b) Supervisory control and Data Acquisition System.

c) Telemetering

d) Remote Terminal Unit.

Q9) a) Explain the concept of compensation of line and discuss briefly different methods of compensation. **[8]**

b) Draw a typical loading capability curve of a generator. Explain the effect of variation of reactive power on operation of synchronous generator. **[8]**

OR

Q10)a) What is static compensator? Explain with diagrams working principles of various types of static compensators. **[10]**

b) Write a note on – FACTS Controllers. **[6]**

Q11)a) Discuss the interchange of power between interconnected utilities. **[9]**

b) Explain the following terms:

i) Economy interchange evaluation. **[4]**

ii) Interchange evaluation with Unit Commitment. **[5]**

OR

Q12) Write short notes on:

a) Capacity and diversity interchange. **[4]**

b) Energy banking. **[4]**

c) Emergency power interchange. **[3]**

d) Inadvertent power exchange. **[3]**

e) Power pools. **[4]**

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