USN | | | | | | | | | | 06EE81

Eighth Semester B.E. Degree Examination, June/July 2013
Industrial Management, Electrical Estimation and Economics

Time: 3 hrs.   Max. Marks:100

Note: *Answer FIVE full questions, selecting*
at least TWO questions from each part.

PART – A

1   a.   Describe the procedure for the selection and placement of workers.   **(10 Marks)**
    b.   Describe clearly the various methods of training executive personal.   **(10 Marks)**

2   a.   What is meant by plant location? Discuss the steps to be taken in choosing a location of the plant.   **(10 Marks)**
    b.   What are the different types of automation? Explain them in detail. Mention the advantages, disadvantages and application of automation.   **(10 Marks)**

3   a.   What are the various methods adopted to avoid low power factor? Explain in detail methods, advantages and disadvantages of the above.   **(10 Marks)**
    b.   A delta connected 440 V, 50 Hz induction motor takes a line current of 50 A at p.f. of 0.8 lagging. Three star connected condensers are used to raise the p.f. to 0.95. Find the KVA rating of the condenser and capacitance of each condenser.   **(10 Marks)**

4   a.   What are the various factors that govern a tariff? Explain clearly the effects of these factors on tariff.   **(10 Marks)**
    b.   An industrial concern has a maximum demand of 750 kW and a load factor of 0.3. The energy can be obtained from i) Public supply at the rate of Rs.1000 per kW of max demand p.a. plus Rs.1.2 per kWh   ii) Private oil engine generating plant, whose details are as follows: Cost of the engine plant = Rs.50 lakhs, Cost of fuel = Rs.800 per tonne, Fuel consumption = Rs.0.4 per kWh of energy generated, Wages = Rs.1500000, Interest on depreciation = 15%, Cost of maintenance p.a. = Rs.0.3 per kWh generated. Compare the total annual charges for both supplies and suggest which one is cheaper.   **(10 Marks)**

PART – B

5   a.   Mention the various methods of selection and equipment. Explain the present worth method of cost comparison between the two equipments.   **(10 Marks)**
    b.   A motor has a useful life of 25 years and cost Rs.50000 with a scrap value of Rs.5000. The annual working expenditure is Rs.20000. The corresponding figures for a second motor are 25 years, Rs.60000, Rs.8000 and Rs.15000. Money is work at 12% per annum. Find, which of the motors is more economical. Use annual cost basis. What are the annual saving in Rs.?   **(10 Marks)**

6   a.   What is meant by earthing? Explain necessity of earthing. With neat sketch explain the pipe earthing.   **(10 Marks)**
    b.   The plan of residential house is shown in Fig. Q6 (b). Assume the height of the ceiling as 3.5 m and one plug point is to be provided in room and hall. The wiring is to be PVC casing and capping. Assume suitable voltage
        i)   Decide the number of subcircuits.
        ii) Decide the size of the PVC cable to be used.
        iii) Calculate the length of PVC casing and capping.
        iv) Calculate the length of conduit of 19 mm size.
        v)   Draw the wiring plan and state the assumption made.   **(10 Marks)**

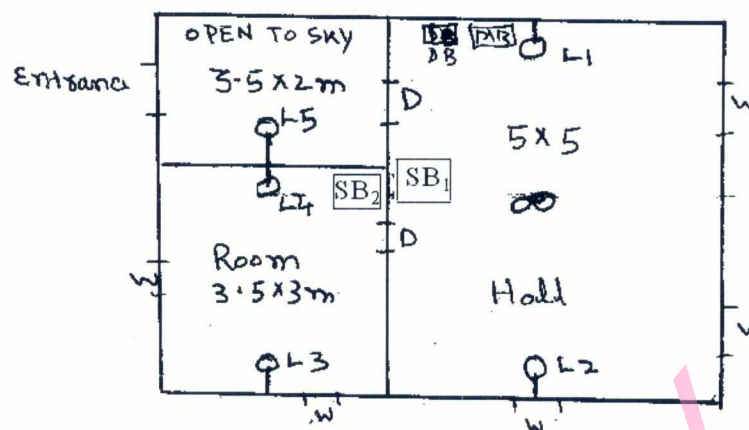**Q.No.6 (b) Contd…**

Fig. Q6 (b)

7   a.   Mention the codes of practice for power installation.   **(05 Marks)**

    b.   Estimate the quantity of materials required to install two, 3-ϕ, A.C., 415 V, 50 Hz squirrel cage. Induction motors to be installed in a workshop. The rated outputs of the motors and their locations are as shown in Fig. Q7 (b). Draw the wiring diagram, assuming the height of the roof as 3.5 m.   **(15 Marks)**
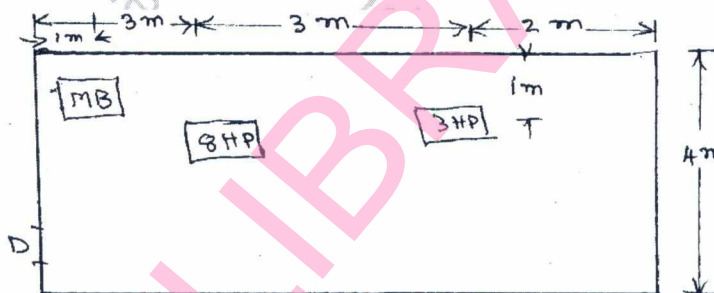

Fig. Q7 (b)

8   a.   Sketch the break even chart and explain.   **(05 Marks)**

    b.   What is meant by inventory control? Mention its advantages.   **(05 Marks)**

    c.   The cost of an electrical machine is 80000 and its salvage value at the end of 10 years is Rs.5000. Find the book value of the machine at the end of 6 years using, i) Straight line method, ii) reducing balance method   iii) sum of years digit's method.   **(10 Marks)**

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Eighth Semester B.E. Degree Examination, June/July 2013

Power System Operation and Control

Time: 3 hrs.   Max. Marks:100

Note: *Answer FIVE full questions, selecting*
at least TWO questions from each part.

PART – A

1   a. What is control centre of a power system? Explain the functions of control centre. **(06 Marks)**
     b. What is SCADA? Why do we need it? Explain the critical functions SCADA system.
     (06 Marks)
     c. With the help of a block diagram, explain the function of typical digital computer control
        and monitory system in a power system. **(08 Marks)**

2   a. Explain the advantages and disadvantages of interconnected power system. **(06 Marks)**
     b. What is area control error? Explain with a neat figure. **(06 Marks)**
     c. With relevant graphs, explain parallel operation of generators for the following cases:
        i)   Generator with infinite bus
        ii) Two generators with different capacity and regulation. **(08 Marks)**

3   a. With a block diagram representation, explain tie-line bias control of a two area load
        frequency control. **(12 Marks)**
     b. An interconnected 60 Hz power system consists of one area with three generating units 500,
        750 and 1000 MVA respectively. The regulation constant of each unit is R = 0.05 pu on its
        own rating. Each unit is initially operating at one half of its rating, when the system load
        suddenly increases by 200 MW. Determine:
        i)   The area frequency response characteristics on a 1000 MVA system base.
        ii) The steady state frequency deviation of the area.
        iii) The increase in turbine power output. **(08 Marks)**

4   a. Explain generation and absorption of reactive power in electrical power systems. **(06 Marks)**
     b. Briefly explain the different methods of reactive power injection in power system. **(06 Marks)**
     c. In a radial transmission system shown in Fig.Q4(c), all per unit values are referred to the
        voltage bases shown and 100 MVA. Determine the power factor at which the generator must
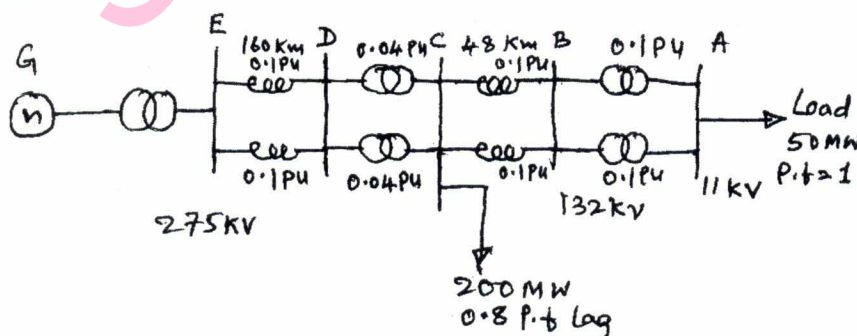   operate. **(08 Marks)**

Fig.Q4(c)

PART – B

5 a. Derive an expression for transmission loss as a function of plant generation. **(10 Marks)**

b. Incremental fuel cost is Rs/MWhr for a plant of a two units.

$$\frac{dc_1}{dpg_1} = 0.25pg_1 + 40; \qquad \frac{dc_2}{dpg_2} = 0.3pg_2 + 30$$

Assume that both the units are operating at all times and total load varies from 40 MW to 250 MW. How will the load be shared for a load of 200 MW? What is the corresponding value of plant incremental cost? Also determine the saving in the fuel cost in Rs/hr for one optimum scheduling of 250 MW as compared to equal distribution of same load between two plants. **(10 Marks)**

6 a. What is unit commitment problem? Discuss the constraints in unit commitment problem.
(10 Marks)

b. With the help of flow chart, explain the dynamic programming method in unit commitment solution. **(10 Marks)**

7 a. Discuss the factors affecting power system security. **(06 Marks)**

b. Explain, security constrained optimal power flow. **(06 Marks)**

c. With a flow chart, explain contingency analysis. **(08 Marks)**

8 Write short notes on:

a. Spinning reserve

b. Voltage collapse

c. B-coefficients

d. Sensitivity factors **(20 Marks)**

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06EE831

Eighth Semester B.E. Degree Examination, June/July 2013
Modern Power System Protection

Time: 3 hrs.   Max. Marks:100

Note: *Answer FIVE full questions, selecting*
at least TWO questions from each part.

PART – A

1 a. Mention the advantages and disadvantages of static relays over electromechanical relays.
   (05 Marks)
   b. Explain the basic construction of a static relay with the help of a block diagram. **(05 Marks)**
   c. Explain the working of the following with circuit diagrams:
   i) Level detector and ii) Time delay circuits. **(10 Marks)**

2 a. Explain the application of replica impedance and mixing transformers in static relays.
   (10 Marks)
   b. Derive the general equation for corine type phase comparator and hence plot the following
   characteristics: i) ohm; ii) Mho characteristics. **(10 Marks)**

3 a. With a neat circuit diagram, explain the working of a coincidence type rectifier phase
   comparator. **(10 Marks)**
   b. With a neat circuit diagram, explain the working of coincidence type zener diode phase
   comparator. **(10 Marks)**

4 a. What is a numerical relay? Mention its advantages. **(05 Marks)**
   b. Explain the working of a numerical relay with the help of a block diagram. **(10 Marks)**
   c. State and explain the principle of duality as applied to two-input amplitude and phase
   comparators. **(05 Marks)**

PART – B

5 a. List out the different types of time-current relay characteristics. Mention the applications of
   each type. **(10 Marks)**
   b. Describe the working principle of instantaneous over current relay. What improvements are
   made in the commercial version of the same? **(10 Marks)**

6 a. Describe the principle and working of a static timer relay using controlled charging of a
   capacitor. **(10 Marks)**
   b. Explain the operating principle of an impedance relay. **(05 Marks)**
   c. Give the comparison between a reactance relay and a Mho relay. **(05 Marks)**

7 a. Discuss the effect of i) System transients and ii) Normal load, on distance measurement in
   distance relays. **(10 Marks)**
   b. A 110kV line of 35km length is protected by impedance relay. The first stage of distance
   relay protects 90% of the line. Calculate the setting of impedance relay and draw the
   characteristic of line and the relay on R-X plane. Neglect the influence of arc resistance. The
   line impedance is 0.24 + j0.41 ohms per conductor per km. C.T. ratio is 300/1 Amps and
   V.T. ratio is 100kV/100V. **(10 Marks)**

8 a. With a block diagram, explain the working of a microprocessor based impedance relay.
   (10 Marks)
   b. Draw the flow chart of a microprocessor based over current relay. **(05 Marks)**
   c. Mention the advantages of microprocessor based relays over static relays. **(05 Marks)**

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Eighth Semester B.E. Degree Examination, June/July 2013
Operations Research

Time: 3 hrs.   Max. Marks:100

Note: *1. Answer FIVE full questions, selecting atleast TWO questions from each part.*
2. Normal distribution characteristics/probability tables are allowed/permitted.

PART – A

1 a. Briefly explain the following : i) The applications of OR
                                                     ii) The different phases of OR.   **(10 Marks)**
   b. An electric appliance company produces two types of products : refrigerators and
      televisions. The company's two products are produced and sold on weekly basis. The
      weekly production connot exceed 25 refrigerators and 35 televisions. The company regularly
      employs a total of 60 workers. A refrigerator requires 2 – man- weeks of labour, while
      television requires 1 – man – week of labour. A refrigerator contributes a profit of Rs. 60
      and television contributes a profit of Rs. 40. How many units of refrigerators and televisions
      should the company produce to realize the maximum profit? Formulate LPP and solve it by
      graphical method.   **(10 Marks)**

2 a. Solve the following LPP using two -phase simplex method :
      Maximize $Z = 8x_2$
      Subject to the constraints : $x_1 - x_2 \geq 0$
      $\qquad\qquad\qquad\qquad\qquad 1 + 3x_2 \leq -6$
      $\qquad\qquad\qquad\qquad\qquad x_1$ and x_2 are un-restricted.   **(12 Marks)**
   b. Solve the following LPP using simplex method and comment on the result
      Maximize $Z = 3x_1 + 2x_2$
      Subject to : $x_1 - x_2 \leq 1$
      $\qquad\qquad 3x_1 - 2x_2 \leq 6$
      $\qquad\qquad x_1 \geq 0$ and $x_2 \geq 0$.   **(08 Marks)**

3 a. Construct the dual of the following problem :
      Minimize $Z = x_2 + 3x_3$
      Subject to $\quad 2x_1 + \;\; x_2 \leq 3$
      $\qquad\qquad\quad x_1 - 2x_2 + 6x_3 \geq 5$
      $\qquad\qquad - x_1 + \;\; x_2 + 2x_3 = 2$
      $\qquad\qquad\quad x_1 \geq 0, \; x_2 \geq 0$ and $x_3 \geq 0$.   **(05 Marks)**
   b. Consider the following LPP :
      maximize $Z = 5x_1 + 2x_2 + 3x_3$
      subject to : $\qquad x_1 + 5x_2 + 2x_3 = 30$
      $\qquad\qquad\qquad x_1 - 5x_2 - 6x_3 \leq 40$
      $\qquad\qquad\qquad x_1 \geq 0, \; x_2 \geq 0$ and $x_3 \geq 0$.
      The optimal solution of the above LPP yields the following objective function : $z - 23x_2 +$
      $7x_3 + (5 + M) x_4 + 0x_5 = 150$ where artificial variable x_4 and slack x_5 are the starting basic
      variables. Write the associated dual problem and determine its optimal solution from the
      optimal Z – equation.   **(07 Marks)**
   c. Briefly explain the stepping tone method and MODI method of testing the optimality in
      transportation problem.   **(08 Marks)**

4 a. Four different jobs can be done on four different machines. The matrix below gives the cost in rupees of producing job 'i' and on machine 'j'.

	M_1	M_2	M_3	M_4
J_1	5	7	11	6
J_2	8	5	9	6
J_3	4	7	10	7
J_4	10	4	8	3

Jobs

Represent the problem as an LP problem and how should the jobs be assigned to the various machines so that the total cost is minimized. **(08 Marks)**

   b. An electrical service engineer has to visit five places A, B, C, D and E. The costs of going from one place to another are given below. Determine the optional route and cost. **(08 Marks)**

	A	B	C	D	E
A	∞	7	6	8	4
B	7	∞	8	5	6
C	6	8	∞	9	7
D	8	5	9	∞	8
E	4	6	7	8	∞

   c. Formulate transportation problem as an LP problem and explain. **(04 Marks)**

PART – B

5 a. Solve the following LPP by using revised simplex method :
   Maximize $Z = 5x_1 + 4x_2$
   Subject to : $6x_1 + 4x_2 \leq 24$
   $x_1 + 2x_2 \leq 6$
   $x_2 - x_1 \leq 1$
   $x_2 \leq 2$
   $x_1 \geq 0, x_2 \geq 0$.   **(12 Marks)**

   b. Solve the following LPP by using duel simplex method :
   Minimize $Z = x_1 + 2x_2 + 3x_3$
   Subject to : $2x_1 - x_2 + x_3 \geq 4$
   $x_1 + x_2 + 2x_3 \leq 8$
   $x_2 - x_3 \geq 2$
   $x_1 \geq 0, x_2 \geq 0$ and $x_3 \geq 0$.   **(08 Marks)**

6 a. Define saddle point and two person zero sum game.   **(04 Marks)**

   b. Solve the following game graphically whose pay off matrix for the player A is given in the following table.   **(10 Marks)**

		Player –A			
		I	II	III	IV
Player –B	I	2	2	3	-2
	II	4	3	2	6

   c. Using dominance property, obtain the optimal strategies for both the players and determine the value of the game. The pay off matrix for player A is given by :

		Player - B				
		I	II	III	IV	
	I	2	4	3	8	4
Player - A	II	5	6	3	7	8
	III	6	7	9	8	7
	IV	4	2	8	4	3

(06 Marks)

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06EE834

Eighth Semester B.E. Degree Examination, June/July 2013
Programmable Logic Controllers

Time: 3 hrs.

Max. Marks:100

Note: *Answer FIVE full questions, selecting*
at least TWO questions from each part.

PART – A

1 a. Explain internal architecture of PLC with a neat block diagram showing bus connection.

(12 Marks)

   b. Explain various terms used for defining the performance of sensors. (08 Marks)

2 a. Explain networks that takes 3 basic forms. (08 Marks)

   b. Write ladder diagram for following logic functions:
   i) AND   ii) OR   iii) NOT (06 Marks)

   c. Represent the following Boolean equation using function block diagram and ladder diagram,
   $(A \cdot B) + (C \cdot D) = Q$ (06 Marks)

3 a. For the instruction shown, draw the equivalent ladder diagram.
   i) LD X400
      AND X401
      LD X402
      ORB
      OUT Y430
      END
   ii) LDI X400
      ANI X401
      ANI X402
      ANI X403
      END
   iii) LD X400
      OR X402
      AND X401
      OUT Y430
      END (06 Marks)

   b. Discuss the location of stop and emergency stop switches in a safe system. (08 Marks)

   c. For the ladder diagram shown in figure Q3 (c)-i and Q3 (c)-ii, obtain its equivalent sequential function chart. Also explain the structure of a sequential function chart. (06 Marks)
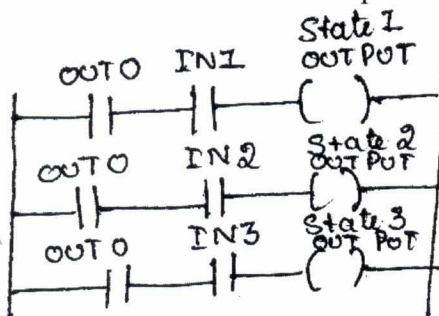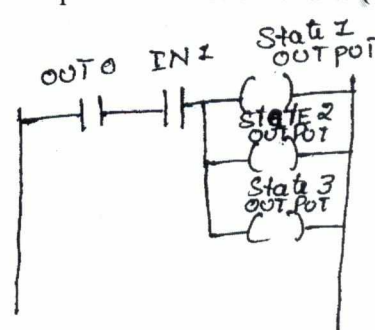

Fig. Q3 (c) – i

Fig. Q3 (c) – ii

4	a.	Illustrate a process requiring subroutine. Draw the required logic diagram.	(06 Marks)
	b.	Explain the jump within jump operations with the help of an example.	(06 Marks)
	c.	Explain conditional statements used in structured text.	(08 Marks)

PART – B

5	a.	Explain the significance of internal relay in PLC operation. With the help of an example explain the role of internal relay in resetting a latch circuit.	(08 Marks)
	b.	Explain the working of battery-backed relays.	(08 Marks)
	c.	Explain response time in internal relays.	(04 Marks)

6	a.	Write a ladder program and timing diagram that would be used to flash light on and off as long as there is some output occurring.	(08 Marks)
	b.	Write a ladder program, where T_{ON} timer and T_{OFF} timer are both used to control a motor.	(06 Marks)
	c.	Explain different types of timers.	(06 Marks)

7	a.	Explain up and down counting.	(04 Marks)
	b.	Explain use of counter to extend the range of timer.	(08 Marks)
	c.	Explain sequences in PLC.	(08 Marks)

8	a.	Explain different methods by which the controller can react to an error signal.	(10 Marks)
	b.	Explain data comparison and arithmetic operations in PLC.	(10 Marks)

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Eighth Semester B.E. Degree Examination, June / July 2013
Renewable Energy Sources

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO question from each part.*

PART - A

1   a. What are the prospects of renewable energy sources in India? Mention the advantages of renewable energy sources. **(10 Marks)**
     b. Explain the significance of energy consumption as a measure of prosperity. **(05 Marks)**
     c. Explain briefly the Indian energy scenario. **(05 Marks)**

2   a. Define the following with respect to solar radiation : i) Latitude angle   ii) Altitude angle   iii) Zenith angle. **(06 Marks)**
     b. Calculate the sunset hour angle and day length at location latitude of 35^0N on February 20th. **(04 Marks)**
     c. What is the difference between a pyrheliometer and pyranometers? With neat sketch, explain the working of Angstrom type pyreheliometer. **(10 Marks)**

3   a. What are the main components of a flat plate solar collector? With a neat sketch, explain the function of each component. **(08 Marks)**
     b. With a neat sketch, explain the working of a solar still. **(06 Marks)**
     c. With a neat sketch, explain the working of solar furnace. **(06 Marks)**

4   a. With a neat sketch, explain the working of a solar pond electric power plant. **(08 Marks)**
     b. What are the advantages and disadvantages of solar PV systems? **(06 Marks)**
     c. With a neat sketch, explain any one type of thermal energy storage system. **(06 Marks)**

PART - B

5   a. What is the basic principle of wind energy conversion system? **(04 Marks)**
     b. Explain the main considerations in selecting a site for wind energy system. **(08 Marks)**
     c. Wind at a velocity of 20m/s, flows through a horizontal axis ,wind turbine having a diameter of 10m. Calculate i) power available in wind ii) power density iii) maximum power which can be extracted iv) Torque at maximum efficiency if rotor speed is 30 r.p.m. Assume density of air = 1.293kg/m^3. **(08 Marks)**

6   a. With a neat sketch, explain the KVIC biogas plant. **(10 Marks)**
     b. Explain the factors affecting biogas generation. **(10 Marks)**

7   a. With a neat sketch, explain the working of open cycle OTEC system for ocean thermal energy. **(10 Marks)**
     b. A single basin type tidal power plant has a basin area of 3km^2. The tide has an average range of 10m, power is generated during flood cycle only. The turbine stops operating when the head on it falls below 3m. Calculate the average power generated by the plant in a single filling process of the basin, if the generator – turbine efficiency is 0.65. Estimate the average annual energy generation of the plant. Density of sea water may be assumed as 1025kg/m^3. **(10 Marks)**

8   a. With a neat sketch, explain the working of fuel cell. **(08 Marks)**
     b. What are the advantages and limitations of hydrogen energy? **(06 Marks)**
     c. What are the advantages and limitations of small hydro resources? **(06 Marks)**

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