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10EE72

Seventh Semester B.E. Degree Examination, Dec.2014/Jan.2015

Electrical Power Utilization

Time: 3 hrs.

Max. Marks:100

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

PART – A

1 a. With a heat sketch, explain the working of a Indirect Resistance Heating. (06 Marks)
   b. What is Resistance welding? With a neat diagram, explain the projection welding. (06 Marks)
   c. A 16 KW resistance oven employing nichrome wire is to be operated from a 220 V, 1φ, power supply. If the temperature of the element is to be limited to 1170°C and average temperature of the charge is 500°C. Find the diameter and length of the element wire. Radiating efficiency is 0.57 and emissivity is 0.9, specific resistance of Nichrome is 109×10^{-8} ohm-m. (08 Marks)

2 a. What is electro deposition? Discuss the factors that influence electro deposition. (06 Marks)
   b. Find the thickness of copper deposited on a plate of area 2.5 cm^2 during electrolysis, if a current of 1A is passed for 100 minutes. Density of copper is 8900 kg/m^3, and ECE of copper is 32.95×10^{-8} kg/coulomb. (08 Marks)
   c. Explain the following terms:
   i) ECE
   ii) Current efficiency
   iii) Energy efficiency (06 Marks)

3 a. State and explain the laws of illumination. (08 Marks)
   b. Explain the direct lighting scheme and indirect lighting schemes. (04 Marks)
   c. Two lamp posts are 14 m apart and are fitted with a 200 cp lamp each at a height of 5 m above ground. Calculate the illumination on the ground (i) under each lamp, (ii) midway between the lamps. (08 Marks)

4 a. Discuss the factory lighting. (06 Marks)
   b. With a neat diagram, explain the construction and working of the sodium vapour lamp. (06 Marks)
   c. An illumination on the working plane of 75 lux is required in a room 72 m × 12 m in size. The lamps are hung at 4 m above the work bench. Assume a space height ratio around unity, utilization factor of 0.5. Consider a lamp efficiency of 14 lumens/Watt and a candle power depreciation of 20%. Estimate the number rating and with a neat sketch show the deposition of the lamps. (08 Marks)

PART – B

5 a. Discuss the direct steam engine system along with their advantages and disadvantages. (08 Marks)
   b. Assume a trapezoidal speed time curve and derive an expression for the maximum speed. (08 Marks)
   c. Define the following terms:
   i) Crest speed
   ii) Schedule speed. (04 Marks)

6 a. Explain the plugging and regenerative braking as applied to the traction motors. **(08 Marks)**

b. Write a note on train lighting system. **(04 Marks)**

c. A train runs between 2 station, 2 km apart at a average speed of 40 kmph. The train is made to run according to the quadrilateral speed time curve. If the max speed is to be limited to 60 kmph, acceleration to 2 kmphps, coasting retardation to 0.15 kmphps and the braking retardation to 3 kmphps. Determine the duration of acceleration, coasting and braking.. **(08 Marks)**

7 a. Define the tractive effort and derive an expression of tractive effort for the propulsion of the train. **(10 Marks)**

b. An electric train has an average speed of 45 kmph on a level track between stops 1.6 km apart. If the acceleration and retardation are 1.8 kmphps and 3.2 kmphps, draw the speed time curve for the run. Determine the energy consumption at axles of the train per tonne km. Take tractive resistance constant at 50 Newton/T and allow 10% for the rotational inertia. **(10 Marks)**

8 a. Discuss the linear induction motor along with its advantages and disadvantages. Mention its application. **(08 Marks)**

b. Explain the shunt transition and bridge transition applied to series parallel starting control of DC motor with a neat sketch. **(08 Marks)**

c. Write a note on hybrid vehicles. **(04 Marks)**

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