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10EE72

**Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018**  
**Electrical Power Utilization**

Time: 3 hrs.

Max. Marks:100

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

**PART – A**

- 1
  - a. Mention advantages of using electricity as a energy source for heating. (06 Marks)
  - b. Discuss the principle of dielectric heating and obtain expression for dielectric power loss. (06 Marks)
  - c. A resistance oven employing Nichrome wire is to be operated from 230V, 1 $\phi$  supply and rated at 16KW. If the temperature of element is to be limited to 1170°C and average temperature of charge is 500°C. Find diameter and length of heating element wire. Take radiating efficiency as 0.57, emissivity as 0.9, specific resistance of Nichrome =  $1.09 \times 10^{-6}$   $\Omega$ -m. (08 Marks)
  
- 2
  - a. With neat diagram explain spot welding. (06 Marks)
  - b. State and explain Faraday's law of electrolysis. (06 Marks)
  - c. What is electro-deposition? Discuss factors which affect quality of electro deposition. (08 Marks)
  
- 3
  - a. Define the following with reference to illumination : i) luminous flux ii) MHCP iii) Coefficient of utilization. (06 Marks)
  - b. Two lamps of 100 cp are mounted on two lamp post 10m apart. the post have different height of 3m and 4m calculate illumination at a point i) midway between the lamp post ii) below the 3m lamp post. (08 Marks)
  - c. Discuss briefly about flood lighting. (06 Marks)
  
- 4
  - a. With a neat diagram, explain the construction ad working of high pressure mercury vapour lamp. (08 Marks)
  - b. It is desired to illuminate drawing hall with an average illumination of 200 lux. The hall is of dimension 30  $\times$  20m<sup>2</sup>. The lamps are fitted 4m from ground. Find number of lamps and watt/lamp. Draw the layout with lamp positions. Take efficiency of lmap = 25 lumen/watt, depreciation factor = 0.8, coefficient of utilization = 0.75, space height ratio is to be 0.8 – 1.2. Verify your design. (08 Marks)
  - c. Compare the performance of LED lamp and CFL lamps. (04 Marks)

**PART – B**

- 5
  - a. Compare main line service, suburban service, urban service with reference to traction. (04 Marks)
  - b. Considering trapezoidal speed time curve approximation prove that crest speed is given as  

$$V_m = \frac{T}{k} - \sqrt{\left(\frac{T}{k}\right)^2 - \frac{7200D}{k}}$$
 where  $k = \frac{1}{\alpha} + \frac{1}{\beta}$ . (08 Marks)
  - c. An electric train has an average speed of 40 kmph on a level track between stops 1500m apart. It is accelerated at 2 kmphs and is braked at 3 kmphs. Calculate time period of acceleration, free running, braking. Draw the speed time curve assuming trapezoidal curve. (08 Marks)

- 6 a. Derive expression for power output from driving axle. (06 Marks)
- b. A 250 tonne motor coach has 4 motors each developing a 6000 Newton-m torque during acceleration starting from rest. If gradient is 40 in 1000, gear ratio = 4, efficiency of gear transmission = 87%, wheel diameter = 80cm, train resistance = 50Nw/Tonne, calculate time taken to attain 50kmph. Allow 12% for additional rotational inertia. If line voltage is 3000V DC and motor efficiency = 85% find current drawn during notching period. (10 Marks)
- c. Define with reference to traction i) Dead weight ii) Coefficient of adhesion. (04 Marks)
- 7 a. Explain with diagram working principle of linear induction motor. (06 Marks)
- b. Explain bridge transition control of DC motors. (06 Marks)
- c. A 400 Tonne electric train has its speed reduced by regenerative braking from 60 to 40 kmph over a distance of 2 km along down gradient of 1.5%. Assuming specific train resistance as 50N/ton, rotational inertia effort = 10%, conversion efficiency of system = 75%. Calculate :
- i) Energy returned to the line
- ii) Average power returned to the line. (08 Marks)
- 8 a. Explain the general electric vehicle configuration with relevant block diagram. (12 Marks)
- b. Explain regenerative braking with reference to DC motors. (08 Marks)

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