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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, 1ϕ 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 = 1.09×10^{-6} Ω-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 $30 \times 20m^2$. 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 kmphps and is braked at 3 kmphps. 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-mt 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 tre 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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