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10EE72

Seventh Semester B.E. Degree Examination, Aug./Sept. 2020
Electrical Power Utilization

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. Explain and design procedure for a circular heating element. (06 Marks)
b. Describe submerged arc welding along with a neat sketch. (06 Marks)
c. A low frequency induction furnace operating at 10V volts in secondary circuit takes 500KW at 0.5pf. When the hearth is full. IF the secondary voltage is maintained at 10 volts estimate the power absorbed and the power factor when the hearth is half-full. Assume the resistance of the secondary circuit to be thereby doubled and the reactance to remain the same. (08 Marks)
- 2 a. Discuss various applications of dielectric heating. (06 Marks)
b. State and explain Faraday's laws of electrolysis. (06 Marks)
A copper refining plant, using 500 electrolyte cells, carries a current of 6000A, voltage per cell being 0.25 volts. If the plant were to work 40 hours/week, calculate the energy consumption per tone, assuming ECE of copper as 0.3281 mg/coulomb of electricity. (08 Marks)
- 3 a. State and explain the laws of illumination. (08 Marks)
b. Two lamps are hung at a height of 9 meters from the floor level. The distance between the lamps is 2 meters. Lamp one is of 500cp. If the illumination on the floor vertically below this lamp is 20 lux, find the candle power of the second lamp. (06 Marks)
c. Explain :
i) Luminous intensity
ii) MHCP
iii) Glare
iv) Maintenance factor
v) Utilization factor. (06 Marks)
- 4 a. Explain with a neat diagram the principle of operation of a sodium vapour lamp. Mention its applications. (08 Marks)
b. A hall 30 mts × 15 mts. With a ceiling height of 5 meters is to be provided with a general illumination of 120 lumens/m². Taking a coefficient of utilization of 0.5 and depreciation factor of 1.4, determine the number of fluorescent tubes required, their spacing, mounting height, and total wattage. Take luminous efficiency of fluorescent tube as 40 lumens per watt for 80 watt tubes. (08 Marks)
c. Explain any two factors to be considered while designing a lighting scheme. (04 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – B

- 5 a. Define the following referred to traction system.
 i) Schedule speed
 ii) Average speed
 iii) Crest speed. (04 Marks)
- b. With usual notations, show that :
- $$V_m = \frac{T}{K} - \sqrt{\left(\frac{T}{K}\right)^2 - \frac{7200D}{K}} \text{ where } K = \left[\frac{1}{\alpha} + \frac{1}{\beta}\right]. \quad (10 \text{ Marks})$$
- c. A train has schedule speed of 30 kmph over a level trace, distance between stations being 1km. Stations stopping time is 20 seconds. Assuming braking retardation of 3 kmphs and maximum speed 25 percent greater than average speed. Calculate acceleration required to run the service, if the speed time curve is approximated by a trapezoidal curve. (06 Marks)
- 6 a. Define specific energy consumption of a train. Derive an expression for specific energy consumption. (12 Marks)
- b. Calculate the specific energy consumption of a maximum speed of 12.2 m/s and for a given run of 1,525 meters resistance during acceleration of 0.366m/s^2 are desired. Train resistance during acceleration is 52.6 Newtons /1000kg and during coasting 6.12 Newtons/1000kg. Effective rotating mass is 10% of the dead weight. The efficiency of the equipment during the acceleration is 65%. Assume a quadrilateral speed – time curve. (08 Marks)
- 7 a. With relevant figures explain bridge transition method of series parallel starting of two DC series motors. (06 Marks)
- b. With a neat diagram, explain the construction and working principle of linear induction motor. (08 Marks)
- c. Discuss the advantages and disadvantages of regenerative braking. (06 Marks)
- 8 a. Briefly explain different types of railway electrification. (10 Marks)
- b. Write a note on :
 i) Tramways
 ii) Trolley buses
 iii) Overhead current collectors for overhead system. (10 Marks)
