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10EE72

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
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. Discuss the construction and working of any type of induction furnace. (08 Marks)
    b. What are the difference between Arc welding and resistance welding? (04 Marks)
    c. A piece of plywood is to be heated by dielectric heating. The area of cross section of the piece is $0.5m^2$ and the thickness is 2.5cm. If the frequency of 25MHz is used and the power observed is 1000 walts. Find the voltage employed necessary for heating. The relative permittivity of wood is 2.5 and power factor is 0.046. (08 Marks)

2   a. State and explain Faraday's laws of electrolysis. (06 Marks)
    b. What factors govern the rate of electro – deposition process? (06 Marks)
    c. A rectangular plate $20 \times 10cm^2$ is to be coated with nickel with a layer of 0.2mm thickness. Determine the quality of electricity in ampere hour and time taken for the process. Current density is 190 amp/m² and current efficiency is 90% and specific gravity of nickel is 8.9. (08 Marks)

3   a. Define and explain the following terms in connection with illumination :
        i)   Illumination
        ii) Solid angle
        iii) Coefficient of utilization
        iv) Space Height Ratio [SHR]. (08 Marks)
    b. State and explain the lows of Illumination. (06 Marks)
    c. A section if a road is to be illuminated by two lamps of 500 cp and 400 cp both horizontally 20m apart and are suspended 6m above the surface level. Calculate illumination at A directly below the lamp of 500cp and at B directly below the lamp if 400 cp. Also calculate illumination at C in the middle of points A and B. (06 Marks)

4   a. What are the different types of lighting schemes? Explain any one in detail. (06 Marks)
    b. Explain with the help of a circuit diagram the working of a fluorescent lamp. (06 Marks)
    c. It is desired to illustrate a drawing, that with an average illumination of 200 lux. The hall is $30 \times 20m^2$. The lamps are to be fitted 4m from ground floor. Find the number of lamps and wattage|lamp for the lighting scheme. Given efficiency of the lamps available as 25 lumens/watt, depreciation factor 0.8 and coefficient of utilization 0.75, space height ratio between 0.8 to 1.2. Give satisfactory spacing arrangement. (08 Marks)

PART – B

5 a. Define the following referred to traction system :
      i) Crest speed ii) Average speed iii) Schedule speed. (06 Marks)
   b. Prove that the crest speed of main line service with trapezoidal speed-time curve can be obtained by the formula :

$$V_m = \frac{T}{K} - \sqrt{\frac{T^2}{K^2} - \frac{7200S}{K}}$$

   (10 Marks)

   where $K = \frac{1}{\alpha} + \frac{1}{\beta}$

   c. What are the advantages of electric traction over the other forms of traction with reference to suburban traffic? (04 Marks)

6 a. Define specific energy consumption of a train. Derive an expression for specific energy consumption. (10 Marks)
   b. A train runs with an average speed of 40kmph. Distance between the station is 2km. Values of acceleration and retardation are 1.5 kmphs and 2.5 kmphps respectively. Find the maximum speed of train assuming trapezoidal speed time curve. (10 Marks)

7 a. Write a short notes on :
      i) Suitability of DC series motor for traction service
      ii) Different types traction system in India. (10 Marks)
   b. With a neat diagram, explain the construction of working of a single phase AC series motor. (10 Marks)

8 a. Briefly explain different systems of railway electrification. (10 Marks)
   b. With a block diagram, explain the functions of subsystems in an electric vehicle. (10 Marks)

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