



P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fifth Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; Dec. - 2019

Utilization of Electrical Power

Time: 3 hrs

Max. Marks: 100

Note: Answer FIVE full questions, selecting ONE full question from each unit.

UNIT - I

- | | | |
|------|--|----|
| 1 a. | Discuss the advantages of electric heating as compared to other heating methods. | 4 |
| b. | Explain the design procedure of the heating elements when the power and voltage of the oven are known? | 6 |
| c. | In a 3 phase area furnace to melt 4.3 tonnes of steel in 1 hr, estimate the average input to the furnace, if overall efficiency is 50%. If the current input is 5700 A with the above kW input and the resistance and reactance of the furnace leads [including transformer] are 0.008 Ω and 0.014 Ω respectively. Estimate the arc voltage, arc resistance, power factor of the current drawn from the supply and average kVA input to the furnace. Specific heat of steel is 0.5 kJ/kg $^{\circ}$ C, Latent heat of steel is 37.2 kJ/kg, melting point of steel is 1370 $^{\circ}$ C, initial temperature of steel is 19.1 $^{\circ}$ C. | 10 |
| 2 a. | Explain clearly with relevant diagrams about Butt welding process and spot welding process. | 8 |
| b. | What is electric arc welding? Explain the process of submerged arc welding. | 7 |
| c. | Discuss briefly about different equipments used in electric welding process. | 5 |

UNIT - II

- | | | |
|------|--|----|
| 3 a. | Define and narrate cosine rule. | 5 |
| b. | Give the requirement of good lighting scheme in general. | 10 |
| c. | A lamp having uniform CP of 250 in all directions in parallel with reflector which directs 65% of the total light uniformly on to a circulate area of 8 m. dia. The lamp is hung 6.5 m above the area. Calculate the illumination at; | 5 |
| | i) Centre | |
| | ii) At the edge of the surface with and without reflector | |
| 4 a. | What are the factors to be considered while planning a lighting scheme? | 5 |
| b. | Mention the advantages of compact fluorescent lamps over connectional lamps. | 5 |
| c. | A drawing hall 30m \times 15m with a ceiling height of 5 m is to be provided with a general illumination of 120 lux. 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. Taking luminous efficiency of fluorescent tube as 40 lumens/watt for 80 watt tubes. | 10 |

UNIT - III

- 5 a. Discuss about the need of an ideal traction system. 5
- b. Explain the systems of traction with merits and demerits. 10
- c. Write a brief note on electric trains. 5
- 6 a. Explain about different systems of electric traction. 10
- b. Discuss about different systems of track electrification. 10

UNIT - IV

- 7 a. Mention the advantages of speed time curve. 4
- b. Draw and explain the speed time curve of various modes of fraction. 9
- c. A schedule speed of 45 km per hour is required between two stops 1.5 km apart. Find the maximum speed over the run if the stop is of 20 second duration. The values of acceleration and retardation are 2.4 kmphps and 3.2 kmphps respectively. Assume a simplified trapezoidal speed time curve. 7
- 8 a. Define the terms 'Coefficient of adhesion' and explain the factors on which it depends. 6
- b. An electric train has an average speed of 42 km per hour on a level track between stops 1400 m apart. It is accelerated at 1.7 km per hour per second and it is braked 3.3 km per hour per second. Draw the speed time curve of the run. Estimate the energy consumption of the axles of the train per tonne-km. Tractive resistance is constant at 50 newton per tonne and allow 10% for rotational inertia. 10
- c. Define schedule speed and average speed. 4

UNIT - V

- 9 a. Describe all the characteristics of AC series motor with relevant diagram. 10
- b. Show that theoretical overall starting efficiency is 66.7% in series parallel method of starting considering two motors. 10
- 10 a. Explain plain rheostatic starting method as applied to a DC series motor. Draw voltage drop and energy loss diagrams. 10
- b. With a neat sketch, explain the construction and operating principle of a linear induction motor. Also mention its advantages. 10

* * *