



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 - 2017/Jan - 2018

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. Explain the different modes of heat transfer with their heat equation. 6
- b. Explain the Induction heating furnace with vertical core type. 6
- c. A cubic water tank has surface area of 6.0 m^2 and is filled to 90% capacity six times daily. The water is heated from 20°C to 65°C . The loss per square metre of tank surface per 1°C temperature difference is 6.3 W . Find the loading in kW and the efficiency of the tank. 8
Assume specific heat of water = $4200 \text{ J/kg}^\circ\text{C}$ and one kWh = 3.6 MJ .
- 2 a. With the help of a neat diagram, give the constructional details of an Indirect Arc furnace. 6
- b. Describe the process of Carbon Arc welding. 6
- c. In a 3 phase arc furnace to melt 10 tonnes of steel is 2 hours, estimate the average input to the furnace, if overall efficiency is 50%. If the current input is 9000 A with the above kW input and the resistance and reactance of furnace leads (including transformer) are 0.003Ω and 0.005Ω respectively. Estimate the arc voltage and total kVA taken from the supply. 8
Specification of steel = $444 \text{ J/kg}^\circ\text{C}$
Latent heat of fusion of steel = 37.25 kJ/kg
Melting point of steel = 1370°C

UNIT - II

- 3 a. Explain the two laws of Illumination. 8
- b. What are the factors to be considered in factor lighting design? 6
- c. An Illumination on the working plane of 75 lux is required in a room $(72 \times 15) \text{ m}^2$ in size. The lamps are required to be hung 4 mt above the work bench. Assuming a suitable space height ratio, a utilization factor of 0.5, a lamp efficiency of 14 lumens/watt and a candle power depreciation of 20%, estimate the number, rating and disposition of lamps. 6
- 4 a. Explain the constructional features of sodium vapour lamp with the help of a neat diagram. 6
- b. Give the list of flood lighting schemes and discuss. 6
- c. A building frontage $(50 \times 15) \text{ m}^2$ is to be illuminated by flood lighting projectors situated 25 m away. If the illumination is 100 lux, coefficient of utilization 0.5, depreciation factor 1.5, waste light factor is 1.2, estimate the number and size of projectors. Sketch the projectors recommended indicating the usual adjustments provided. 8

UNIT - III

- 5 a. Give the systems of electric tractions and explain the composite system of electric traction. 6
 b. Compare the AC and DC systems of railway electrification in view of main line. 6
 c. Draw and explain the block diagram of Hybrid Electric Vehicle. 8
- 6 a. Explain the DC system of track electrification. 8
 b. What are the requirements of an ideal tractors system? 6
 c. Explain tram ways and their usage. 6

UNIT - IV

- 7 a. Explain a typical speed time curve and define the terms crest speed, average speed and scheduled speed. 6
 b. What are the factors affecting scheduled speed. 6
 c. Derive the expression for maximum speed assuming Trapezoidal speed time curve. 8
- 8 a. Derive the expression for Tractive effort. 10
 b. An electric train has quadrilateral speed-time curve as follows :
 i) Uniform acceleration from rest at 2 kmphs for 30 seconds
 ii) Coasting for 50 seconds
 iii) Uniform braking to rest for 20 seconds. 10
- If the train is moving up a gradient of 10/1000, train resistance is 40 NW/tonne, rotational inertia effect 10% of dead weight and duration of stop 30 seconds, find the scheduled speed.

UNIT - V

- 9 a. List out the general features of traction motors for both mechanical and electrical. 10
 b. Give the explanation regarding AC series motor with its vector diagram. 10
- 10 a. Give the constructional features and its speed thrust graph for a Linear Induction Motor. 10
 b. Explain the serial-parallel control of speed for a traction motor. 10

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