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

(An Autonomous Institution affiliated to VTU, Belgaum)

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

Semester End Examination; Dec - 2016/Jan - 2017

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. List the properties of good heating element. 4
- b. Explain with the help of a neat sketch, the working of Ajax Wyatt furnace. What is its field of application? 10
- c. Compare AC and DC Welding. 6
- 2 a. Discuss the methods of temperature control of resistance ovens. 4
- b. A cubic water tank has surface area of 5.4 m^2 and is filled to 92 percent capacity five times daily. The water is heated from 15°C to 60°C . The losses per square metre of tank surface per 1°C temperature difference are 5.9 watts. Calculate; 6
- (i) Loading in kW (ii) Efficiency of tank.
Assume specific heat of water = $4.186 \text{ kJ/kg}^\circ\text{C}$ and $1 \text{ kWh} = 3600 \text{ kJ}$.
- c. With neat sketch, explain the various methods of resistance welding. 10

UNIT - II

- 3 a. Explain the laws of Illumination. 6
- b. Define the following : 4
- (i) Luminous Intensity (ii) Space Height Ratio
- (iii) Utilization Factor (iv) Waste Light Factor.
- c. Explain the construction and working principle of Fluorescent lamp. 10
- 4 a. A room $17 \text{ m} \times 6 \text{ m}$ is illuminated by twenty 200 watt lamps. The MSCP of each lamp is 250. Assuming a depreciation factor of 1.2 and utilization factor of 0.6. Find the average illumination produced in the floor. 4
- b. Explain how flood lighting is provided and the design considerations involved. 6
- c. Explain the principle and operation of a sodium vapour lamp giving its neat sketch. Mention its uses. 10

UNIT - III

- 5 a. What do you mean by Electric Traction? Mention its uses. 4
- b. Mention the requirements of an ideal traction system. 6
- c. Explain briefly the systems of railway electrification. 10

- 6 a. Explain the different systems of Traction and mention its advantages and disadvantages. 10
- b. Compare the DC and AC systems of railway electrification from the point of main line and suburban line railway service. 10

UNIT - IV

- 7 a. Draw and explain a typical speed time curve for an electric train movement. 10
- b. Derive an expression for the tractive effort developed by a train unit. 10
- 8 a. Define the following :
- (i) Crest speed (ii) Schedule speed 8
- (iii) Coefficient of Adhesion (iv) Tractive effort.
- b. A schedule speed of 45 km/h is required between two stops 1.5 km apart. Find the maximum speed over the run, if the stop is 20 seconds duration. The values of acceleration and retardation are 2.4 km/h/s and 3.2 km/h/s respectively. Assume a simplified trapezoidal speed-time curve. 6
- c. What is specific energy consumption? Enumerate the factors which affect the specific energy consumption of trains operating at a given schedule speed. 6

UNIT - V

- 9 a. Explain briefly desirable properties of traction motors. 10
- b. Mention the requirements of a braking system and explain briefly rheostatic braking method. 10
- 10 a. Discuss the suitability of series motors of traction duties with the help of characteristic curves. 8
- b. Mention the advantages and disadvantages of electrical braking over mechanical braking. 6
- c. Explain briefly the thyristor control of DC motor. 6

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