

# CBCS SCHEME

18EE742

USN

Seventh Semester B.E. Degree Examination, Dec.2024/Jan.2025

## Utilization of Electrical Power

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. What is electrical heating? Mention advantages and disadvantages of electrical heating. (06 Marks)
- b. Derive and explain the design procedure for circular and rectangular strip heating element. (08 Marks)
- c. A 15 KW, 220 V, single phase resistance oven employs nickel-chrome wire for heating elements. If the wire temperature is not to exceed  $1000^{\circ}\text{C}$  and the temperature of the charge is to be  $600^{\circ}\text{C}$ . Calculate the diameter and length of the wire. Assume radiating efficiency to be 0.6 and emissivity as 0.9. For nickel chrome resistivity is  $1.016 \times 10^{-6} \Omega\text{-m}$ . (06 Marks)

OR

- 2 a. State and explain Faraday's law of electrolysis. (06 Marks)
- b. With a neat sketch, explain the construction and working principle of vertical core type furnace. (08 Marks)
- c. Define welding process. Discuss about Laser Welding with a neat sketch. (06 Marks)

### Module-2

- 3 a. State and explain laws of illumination. (06 Marks)
- b. What are polar curves? Explain about Rousseau's construction? (06 Marks)
- c. Two similar lamps having uniform intensity of 500 cp in all directions below the horizontal are mounted at a height of 4 meters. What must be the maximum spacing between the lamps so that illumination on the ground midway between the lamps shall be atleast one half the illumination directly under the lamps. (08 Marks)

OR

- 4 a. Define the following:
  - (i) Luminous flux
  - (ii) Luminous intensity
  - (iii) Illumination
  - (iv) Mean spherical candle power(08 Marks)
- b. Discuss about requirements of good lighting. (06 Marks)
- c. What is photometry? Explain about the principle of photometry. (06 Marks)

### Module-3

- 5 a. Using a trapezoidal speed time curve, derive an expression for its maximum speed. (07 Marks)
- b. An electric train is to have acceleration and braking retardation of  $0.8 \text{ km/h/s}$  and  $3.2 \text{ km/h/s}$  respectively. If the ratio of maximum to average speed is 1.3 and time for stops 26 seconds, find schedule speed for a run of 1.5 km. Assume simplified trapezoidal speed-time curve. (07 Marks)
- c. Discuss the factors affecting specific energy consumption. (06 Marks)

OR

- 6 a. Explain with the help of suitable circuit diagrams (i) Shunt transition (ii) Bridge transition as applied to a pair of d.c. traction motors. (06 Marks)
- b. Define the following terms:
- (i) Dead weight
  - (ii) Accelerating weight
  - (iii) Adhesive weight
  - (iv) Coefficient of adhesion (08 Marks)
- c. With a neat diagram, explain the construction and working of a single phase series motor. (06 Marks)

Module-4

- 7 a. Explain how plugging, rheostatic braking and regenerative braking are employed with dc motor. (07 Marks)
- b. A train weighing 500 tonnes is going down a gradient of 20 in 1,000. It is desired to maintain train speed at 40 kmph by regenerative braking. Calculate the power fed into the line tractive resistance is 40 N/tonne and allow rotational inertia of 10% and efficiency of conversion of 75%. (07 Marks)
- c. Write short notes on mechanical braking arrangements used in electric traction. (06 Marks)

OR

- 8 a. Write short notes on:
- (i) Trolley buses
  - (ii) Pantograph collector
  - (iii) Trolley wires (10 Marks)
- b. With a neat sketch, explain the function of a negative Booster in tramway system. (10 Marks)

Module-5

- 9 a. With a relevant block diagram, discuss the working principle of hybrid electric vehicle. (10 Marks)
- b. Discuss the electric energy consumption in an electric vehicle. (10 Marks)

OR

- 10 a. Explain the configuration of electric vehicle with neat diagram. (10 Marks)
- b. Write notes on:
- (i) Series hybrid drive train
  - (ii) Parallel hybrid drive train (10 Marks)

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