



# CBCS SCHEME

17EE742

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## Seventh Semester B.E. Degree Examination, June/July 2024 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. Derive and explain the design procedure for a circular and rectangular strip heating element. (08 Marks)
- b. A 16kW resistance oven employing Nichrome wire is to be operated from a 220V, single phase power supply. If the temperature of the element is to be limited to 1170°C and average temperature of the charge is 500°C, find the diameter and length of the element wire. Radiating efficiency is 0.57, emissivity is 0.9, and specific resistance of Nichrome is  $109 \times 10^{-8}$  ohm-m. (06 Marks)
- c. Explain high frequency dielectric Heating. (06 Marks)

OR

- 2 a. With a neat sketch, explain flash butt welding and spot welding. (08 Marks)
- b. A worn-out cylinder shaft 14cm in diameter and 30cm long is to be repaired by coating it with a layer of 1.5mm Nickel. Determine the theoretical value of current required and the time taken if the current density used is 200Amp/m<sup>2</sup>. ECE of Nickel is 0.000304gm/coulomb and density of Nickel is 8.9gm/cm<sup>3</sup>. (06 Marks)
- c. Discuss the factors affecting electro deposition process. (06 Marks)

### Module-2

- 3 a. Define the terms i) Solid angle ii) Plane angle. State and explain the laws of illuminations. (08 Marks)
- b. If the Lamp of 200cp is placed 1 meter below a plane mirror which reflects 90% of light falling on it. Determine illumination at a point 3 meters away from foot of lamp, which hung 4 meters above the ground. (08 Marks)
- c. Mention the importance of polar curve. (04 Marks)

OR

- 4 a. Discuss the requirement of good lighting. (08 Marks)
- b. With a neat diagram, explain the construction and working of sodium vapour lamp. (08 Marks)
- c. Mention the factors to be considered while designing lighting schemes. (04 Marks)

### Module-3

- 5 a. Mention advantages and limitations of electric drives. (06 Marks)
- b. Assuming a quadrilateral speed time curve, derive equations for (i) total distance travelled by the train between two stops and (ii) velocity at the time of braking. (08 Marks)
- c. A train is required to run between two-stations 1.0 km apart at a schedule speed of 30 kmph the stopping time is 20 secs. Assume braking retardation 3 kmphs and maximum speed 1.25 times average speed. Determine acceleration required to run the service for a trapezoidal curve. (06 Marks)

OR

- 6 a. A 256 tonne motor coach train with 4 motors takes 20 secs to attain a speed of 40.25 kmph starting from rest on a 1 percent up-gradient. The gear ratio is 3.5 and gear efficiency 95%, wheel diameter 91.5 cm, train resistance 44 NW/tonne and rotational inertia 10% of the dead weight. Find the torque developed by each motor. (08 Marks)
- b. With a neat figure, explain the construction and working of a single phase AC series motor. (06 Marks)
- c. Explain (i) Shunt transition (ii) Bridge transition applied to series parallel starting of DC motors with figures. (06 Marks)

Module-4

- 7 a. Mention the advantages and disadvantages of Regenerative braking of electric traction motors. (05 Marks)
- b. Derive an expression for energy returned to the line regenerative braking on a level track. (08 Marks)
- c. Write short notes on :  
 i) Compressed air brakes  
 ii) Magnetic track brakes. (07 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 a tramway system. (10 Marks)

Module-5

- 9 a. Explain the conceptual illustration of general EV configuration. (08 Marks)
- b. With relevant graph, explain train motor characteristics. (08 Marks)
- c. Mention the need for Electric Vehicles. (04 Marks)

OR

- 10 a. Explain the configuration of series hybrid electric drive train. (08 Marks)
- b. Explain the conceptual illustration of hybrid electric drive train. (08 Marks)
- c. Mention the disadvantages of series hybrid electric drive trains. (04 Marks)

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