

CBCS SCHEME

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18EE742

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022

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. Explain the principle of dielectric heating and the factors on which dielectric loss in a dielectric material depends. (08 Marks)
- b. Discuss the principle of arc welding and the difference between carbon and metallic arc welding. (08 Marks)
- c. A three phase, 415 V, 45 kW resistance oven employs nickel-chrome wire for its heating elements. If the wire temperature is not to exceed 1200°C and the temperature of the charge is to be limited to 800°C, calculate the diameter and length of the wire. Assume radiating efficiency as 0.57 and resistivity of nichrome as $1.016 \times 10^{-6} \Omega$ and emissivity as 0.9. (04 Marks)

OR

- 2 a. Explain the principle of high frequency induction heating. What factors control the depth of penetration of heat? (08 Marks)
- b. State Faraday's laws of electrolysis and explain any two applications of electrolysis. (08 Marks)
- c. An insulating material 3 cm thick and 400 cm² in area is to be heated by dielectric heating. The material has a relative permittivity of 6 and a power factor of 0.05. Power required is 600 W at a frequency of 30 MHz. Determine the necessary voltage and the current required. If the voltage were to be limited to 800 V, what will be the frequency of the supply required? (04 Marks)

Module-2

- 3 a. State the laws of illumination and explain the term : (i) Plain angle (ii) Solid angle and establish the relationship between them. (08 Marks)
- b. Explain with a neat diagram, principle of operation of a sodium vapour lamp. Mention its use. (08 Marks)
- c. Two lamp posts are 20m apart and are fitted with lamps of luminous intensity 200 C.P each, at a height of 6 m above the ground. Calculate the illumination on the ground (i) under each lamp (ii) midway between the lamps. (04 Marks)

OR

- 4 a. What are the requirements of a good lighting? (04 Marks)
- b. Write short notes on : (i) Flood lighting (ii) Street lighting. (08 Marks)
- c. A lamp having a uniform C.P of 300 in all directions is provided with a reflector which directs 60 percent of the total light uniformly on to a circular area of 12m diameter. The lamp is 5m above the area. Calculate (i) the illumination at the centre and edge of the surface with and without reflector. (ii) The average illumination over a area without the reflector. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-3

- 5 a. Assuming the quadrilateral speed time curve, derive equation for
 (i) Total distance travelled by the train between two stops
 (ii) Velocity at the time of braking. (08 Marks)
- b. Define specific energy consumption and discuss the factors affecting it. (08 Marks)
- c. A scheduled speed of 45 km/hr is required between two stops 1.5 km apart. Find the maximum speed over the run if the stop is of 20 seconds duration. The values of acceleration and retardation are 2.4 kmphs and 3.2 kmphs respectively. Assume a simplified trapezoidal speed time curve. (04 Marks)

OR

- 6 a. Define Tractive effort. Deduce expression for total tractive effort for propulsion of a train. (08 Marks)
- b. Explain why a series motor is preferred for the electric traction. (04 Marks)
- c. Explain with the help of suitable circuit diagrams
 (i) Shunt transition (ii) Bridge transition as applied to a pair of d.c traction motors. (08 Marks)

Module-4

- 7 a. Describe how plugging, rheostatic braking and regenerative braking are employed with d.c motors. (12 Marks)
- b. Show how sag and tension are calculated in trolley wires. (08 Marks)

OR

- 8 a. Sketch the various arrangement of current collection used in electric traction. (06 Marks)
- b. Explain the function of a negative booster in a tramway system. (06 Marks)
- c. Discuss some of the mechanical braking arrangements used in electric traction. (08 Marks)

Module-5

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

OR

- 10 a. With neat diagram, explain the configuration of electric vehicles. (10 Marks)
- b. Discuss electrical vehicle performance interms of maximum cruising speed, gradeability and acceleration. (10 Marks)
