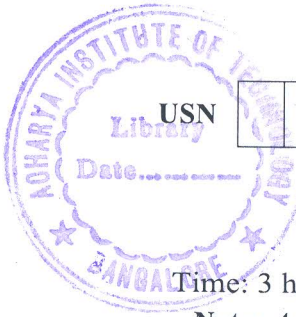


CBCS SCHEME



17EE742

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021 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 109×10^{-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/m². ECE of Nickel is 0.000304gm/coulomb and density of Nickel is 8.9gm/cm³. (06 Marks)
- c. Discuss the factors affecting electro deposition process. (06 Marks)

Module-2

- 3 a. State and explain the laws of Illumination. (06 Marks)
- b. A section of a road is to be illuminated by 2 lamps of 500cp and 400cp, both horizontally 20m apart and are suspended 6m above the surface level. Calculate the illumination at A directly below the lamp of 500cp and at B directly below lamp of 400cp. Also calculate illumination at C in the middle points of A and B. (06 Marks)
- c. With a neat diagram, explain the construction and working of the sodium vapour lamp. (08 Marks)

OR

- 4 a. Define the following terms and mention their units. (08 Marks)
 - i) Luminous flux
 - ii) Luminous Intensity
 - iii) Illumination
 - iv) Mean spherical candle power.
- b. Explain the following : (06 Marks)
 - i) Flood lighting
 - ii) Street lighting.
- c. Discuss the factors to be taken into account for design of lighting scheme. (06 Marks)

Module-3

- 5 a. Define the following terms : (06 Marks)
 - i) Crest speed
 - ii) Average speed
 - iii) Schedule speed.

- b. Derive expression for maximum speed of a Train in terms of distance travelled, acceleration and retardation for Trapezoidal speed time curve. (08 Marks)
- c. An electric train is to have a braking retardation of 3.2Kmphps. If the ratio of maximum speed to average speed is 1.3, the time for stops is 20sec, and acceleration is 0.8kmphps, find its schedule speed for a run of 1.5km. Assume Trapezoidal speed time curve. (06 Marks)

OR

- 6 a. Derive an expression for Tractive effort required for propulsion of a train considering gradient and resistance to train movement. (08 Marks)
- b. A 220 tonne motor coach having 4 motors each developing a torque of 7500N-m during acceleration starts from rest. If up gradient is 25 in 1000, gear ratio 3.2, gear transmission 90%, wheel diameter 92cms, train resistance 45N/tonne, rotational inertia effect 8%, calculate :
- i) the time taken by the coach to attain a speed of 75kmph
- ii) If the supply voltage is 3000V and motor efficiency is 87%, estimate current taken each motor during acceleration period. (08 Marks)
- c. Discuss the mechanical and electrical characteristics of electric motors used for traction work. (04 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. With relevant block diagram, discuss the working principle of Hybrid electric vehicle. (10 Marks)
- b. Discuss the performance of electric vehicle using speed-power characteristics. (10 Marks)

OR

- 10 a. Discuss electric vehicle performance in terms of maximum cruising speed, gradeability and acceleration. (10 Marks)
- b. Discuss the electric energy consumption in an electric vehicle. (10 Marks)

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