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/m^2. ECE of Nickel is 0.000304gm/coulomb and density of Nickel is 8.9gm/cm^3.
   (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.
      i)   Laminous flux
      ii) Luminous Intensity
      iii) Illumination
      iv) Mean spherical candle power. **(08 Marks)**
   b. Explain the following :
      i) Flood lighting
      ii) ii) Street lighting. **(06 Marks)**
   c. Discus the factors to be taken into account for design of lighting scheme. **(06 Marks)**

Module-3

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

b. Derive expression for maximum speed of a Train interms 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 interms of maximum cruising speed, gradeability and acceleration. **(10 Marks)**

b. Discuss the electric energy consumption in an electric vehicle. **(10 Marks)**

* * * * *