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## Seventh Semester B.E. Degree Examination, July/August 2021

### Utilization of Electrical Power

Time: 3 hrs.

Max. Marks: 80

**Note: Answer any FIVE full questions.**

1.
  - a. Draw the equivalent circuit of an arc furnace and thereby obtain the condition for maximum output. (08 Marks)
  - b. A 15 kW, 220 volts single phase resistance oven employs Nickel chrome wire for its heating elements. If the wire temperature is not exceed 1000°C and the temperature of the charge is to be 600°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 =  $1.016 \times 10^{-6} \Omega \text{m}$ . (08 Marks)
2.
  - a. A piece of insulating material is to be heated by dielectric heating. The size of the piece is 12cm × 12cm × 3cm. A frequency of 20 MHz is used and the power absorbed is 450 W. If the material has a relative permittivity of 5 and a power factor of 0.05, calculate the voltage necessary for heating and current that flows in the material. Assume  $\epsilon_0 = 8.854 \times 10^{-12} \text{ F/M}$ . (06 Marks)
  - b. Bring out any five differences between resistance and arc welding. (04 Marks)
  - c. Explain the terms current efficiency, voltage and energy efficiency associated with electrolytic processes. (06 Marks)
3.
  - a. Define the following terms: (i) Solid angle (ii) Light (iii) Luminous intensity (iv) MSCP. (08 Marks)
  - b. Explain the concept of measurement of mean spherical candle power by integrating sphere. (08 Marks)
4.
  - a. Describe the construction and working of an incandescent lamp. (08 Marks)
  - b. Compare the performance of florescent lamp and CFL lamp. (05 Marks)
  - c. A 250 volt lamp has a total flux of 3000 lumens for a current of 0.8 A. Find MSCP per watt. (03 Marks)
5.
  - a. Mention the advantages and limitations of electric drives. (08 Marks)
  - b. With usual notations show that,  $\frac{1}{2} \left[ \frac{1}{\alpha} + \frac{1}{\beta} \right] = \frac{3600D}{V_m^2} \left[ \frac{V_m}{V_a} - 1 \right]$ . (08 Marks)
6.
  - a. Discuss the requirements of electric motors for Traction work. (08 Marks)
  - b. A 200 tonne motor coach has 4 motors, each developing 600 Nm torque during acceleration, start from rest. If the gradient is 30 in 1000, gear ratio 4, gear transmission efficiency 90%, wheel radius 45 cm, train resistance 50 N/tonne and additional rotational inertia 10%, calculate the time taken to attain a speed of 50 kmph. If the line voltage is 3000 volts dc and efficiency of motors 85%, find the current during the notching period. (08 Marks)
7.
  - a. Explain how regenerative and Rheostatic braking is obtained with single phase AC series motors? Three phase induction motor. (08 Marks)
  - b. Describe the concept of electrolysis by currents through earth. (08 Marks)
8.
  - a. Explain the function of a negative booster in a Tramway system. (08 Marks)
  - b. Write a note on : (i) Tramway and (ii) Trolley Bus. (08 Marks)
9.
  - a. Explain configuration of electric vehicles with neat diagram. (08 Marks)
  - b. Discuss the energy consumption in electric vehicles. (08 Marks)
10.
  - a. Discuss the hybrid electric vehicle-working principle, with relevant block diagram. (08 Marks)
  - b. Write a note on: (i) Parallel hybrid drive system (ii) Series hybrid drive system. (08 Marks)

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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.