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NEW SCHEME

Seventh Semester B.E. Degree Examination, May / June 2006
EE/BE

Electrical Power Utilization

Time: 3 hrs.]

[Max. Marks:100

Note: 1. Answer any FIVE full questions.

2. Missing data may be assumed suitably.

- 1
 - a. Explain clearly the merits and demerits of Electrical heating. (05 Marks)
 - b. Mention a few alloys used as heating elements along with their composition. (05 Marks)
 - c. A 15 KW, 220 V, single phase resistance oven employs a nickel-chrome wire for its heating elements. If the wire temperature is not to exceed 1000°C and the temperature of the charge is to be about 600°C , calculate the diameter and length of the wire. Assume radiating efficiency as 0.6 & emissivity constant 0.9. Also determine the temperature of the wire when the charge is cold. (10 Marks)
- 2
 - a. With a neat sketch, explain the construction and the working principle of Ajax-Wyatt furnace. (10 Marks)
 - b. A slab of insulating material 150 cm^2 in area and 1cm thick is to be heated by dielectric heating. The power required is 400 W at 30 MHz. The material has a relative permittivity of 5 and power factor 0.05. Determine the necessary voltage and current that flows in the material. (10 Marks)
- 3
 - a. State Faraday's laws of Electrolysis and explain:
 - i. Electro-chemical equivalent
 - ii. Current efficiency and
 - iii. Energy efficiency. (10 Marks)
 - b. A 20 cm long portion of a circular shaft 10 cm diameter is to be coated with a layer of 1.5 mm nickel. Determine the quantity of electricity in Ah and the time taken for the process. Assume a current density of 195 A/m^2 and current efficiency of 92%. Specific gravity of nickel is 8.9 gm/cm^3 . Electro-chemical equivalent of nickel = 1.0954 kg/1000Ah . (05 Marks)
 - c. Briefly explain the method to be adopted in the extraction of zinc metal. (05 Marks)
- 4
 - a. Explain why dc series motors are ideally suited for traction. (06 Marks)
 - b. Briefly describe the series-parallel starting of two series motors. (06 Marks)
 - c. A locomotive exerts a tractive effort of 33,800 NW in hauling a train at 48.3 kmph on level. It has to haul the same train at the same speed on a gradient and the tractive effort required is 53,400 NW. Find the HP delivered by the locomotive when the motors used are:
 - i. DC Series motors
 - ii. Induction motors. (08 Marks)

Contd... 2

- 5 a. Discuss the different types of electrical braking. (10 Marks)
b. Two dc series motors of a motor coach have resistance of 0.1Ω each. These motors draw a current of 500 A from 600 V mains during series-parallel starting period of 20 secs. If the acceleration during starting period is uniform, determine:
i. Time during which the motors operate in (a) Series & (b) Parallel.
ii. The speed at which the series connections are to be changed if the speed just after starting period is 70 kmph. (10 Marks)
- 6 a. Explain the terms:
i. Illumination
ii. Solid Angle
iii. Luminous Intensity and
iv. Brightness
Mention their units. (10 Marks)
b. A room $17m \times 6m$ is illuminated by twenty 200W lamps. The MSCP of each lamp is 250. Assuming a depreciation factor of 1.2 and utilization factor 0.6, find the average illumination produced on the floor. (10 Marks)
- 7 a. Briefly explain the causes and effects of low power factor. (10 Marks)
b. A single phase 400 V, 50 Hz motor takes a supply current of 50 A at a Pf of 0.6 lag. The motor Pf has been improved to 0.9 lag by connecting a condenser in parallel. Calculate the capacity of the condenser required. (10 Marks)
- 8 Write short notes on any four:
a. Linear induction motor
b. Sodium vapour lamp
c. Speed - Time curves
d. Dielectric heating
e. Current collectors. (20 Marks)
