

CBCS SCHEME

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17EE742

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023

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

- Explain the design procedure of the heating elements when the power and voltage of the oven are known. (06 Marks)
 - Explain the principle of induction heating. (08 Marks)
 - A 15kW, 220V, single phase resistance oven employs nickel chrome wire for its heating elements. If the wire temperature is not to exceed 1000°C and temperature of the charges is to be 600°C, calculate the diameter and length of the wire. Assume radiating efficiency as 0.6 and emissivity as 0.9. (06 Marks)

OR

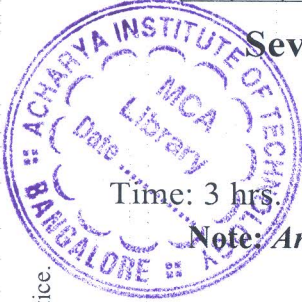
- Explain the basic difference between electric arc welding and resistance welding. (06 Marks)
 - Discuss various laws of electrolysis. What are different applications of electrolysis? (08 Marks)
 - Find the thickness of copper deposited on a plate area of 0.00025m² during electrolysis if a current of one ampere is passed for 100 minutes. Density of copper is 8900Kg/m³ and ECE of copper is 32.95×10^{-8} Kg/coulomb. (06 Marks)

Module-2

- Derive expression for the illumination on a surface i) when it is normal and ii) when it is inclined to the axis of a beam of incident light. (08 Marks)
 - Explain requirement of good lighting system. (06 Marks)
 - Two lamp posts are 16m apart and are fitted with a 100CP lamp each at a height of 6m above ground. Calculate the illumination on the ground
 - under each lamp
 - midway between the lamps. (06 Marks)

OR

- What is photometer? Explain it with a neat sketch. (06 Marks)
 - With a neat diagram, explain the construction and working of a mercury vapour lamp. (08 Marks)
 - Two similar lamps having uniform intensity of 500CP power in all directions below the horizontal are mounted at a height of 4m. What must be the maximum spacing between the lamps so that the illumination on the ground midway between the lamps shall be one half the illuminations directly under the lamps? (06 Marks)



Module-3

- 5 a. Discuss the requirements of an ideal traction system. (06 Marks)
 b. What are simplified speed time curves? For a simplified trapezoidal speed time curve develop an expression for crest speed. (08 Marks)
 c. An electric train is to have acceleration and braking retardation of 0.8km/h/s and 3.2km/h/s respectively. If the ratio of maximum to average speed is 1.3 and time for stops 26 seconds, find schedule speed for a run of 1.5km. Assume simplified trapezoidal speed time curve. (06 Marks)

OR

- 6 a. Define tractive effort. Derive an expression for tractive effort of train considering its movements on upward gradient and having track resistance. (08 Marks)
 b. Mention and discuss any two the factors affecting specific energy consumption (06 Marks)
 c. A 203-tone motor-coach train has four motors each developing a shaft torque of 5130N-m during accelerating period. Calculate the time taken by train to attain a speed of 42kmph starting from rest on a gradient of 1 in 250. The motors have a gear ratio of 3.5 to 1 and gear efficiency is 93%. The wheel diameter is 91.5cm. Assume train resistance as 45N per tonne and allow 10% for the effect of rotation inertia. (06 Marks)

Module-4

- 7 a. Discuss the advantages of electric braking over mechanical braking. (06 Marks)
 b. Mention and write a note on any two factors to be considered while selecting a motor for electric traction purpose. (06 Marks)
 c. Explain series parallel control of dc motors. Discuss how the energy is saved in this method. (08 Marks)

OR

- 8 a. Explain Regenerative braking in traction system. (06 Marks)
 b. Explain the function of a negative booster in a tramway system. (06 Marks)
 c. Show how sag and tension are calculated in a trolley wires. (08 Marks)

Module-5

- 9 a. Explain the conceptual illustration of electric vehicles. (10 Marks)
 b. Discuss the performance characteristics of electric vehicles. (10 Marks)

OR

- 10 a. Explain the conceptual illustration of hybrid vehicles. (10 Marks)
 b. With help of block diagram, explain the architecture of hybrid electric drive trains. (10 Marks)

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