

314323

24225

3 Hours / 70 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
(2) Illustrate your answers with neat sketches wherever necessary.
(3) Figures to the right indicate full marks.
(4) Assume suitable data, if necessary.
(5) Use of Non-programmable Electronic Pocket Calculator is permissible.
(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following : 10
- Define luminous flux and illumination.
 - List any two applications of dielectric heating.
 - State the purpose of a welding transformer.
 - State any two factors affecting the selection of electric drives.
 - Define crest speed and average speed in traction systems.
 - State the requirements of good weld.
 - List any two advantages of LED lamps over CFL lamps.

P.T.O.

- 2. Attempt any THREE of the following :** **12**
- a) Explain the inverse square law and Lambert's cosine law with neat diagrams.
 - b) Compare arc welding and resistance welding.
 - c) Describe the construction and working of the coreless induction furnace.
 - d) Explain the types of gear drive.
- 3. Attempt any THREE of the following :** **12**
- a) A factory space of $33\text{m} \times 13\text{m}$ is to be illuminated with an average illumination of 72 lumens per square meter by 200W lamps. The co-efficient of utilisation is 0.4 and depreciation factor is 1.4. Calculate the no. of lamps required. The lumens output of a 200W lamp is 2730 lumens.
 - b) Explain the procedure to select a suitable electric drive for a rolling mill application.
 - c) Draw and explain the trapezoidal speed-time curve used in traction services.
 - d) A 15 kW single phase 220V resistance oven employs a circular Nichrome wire for its heating element. If wire temperature is not exceed 1000°C and temperature of charge to be 600°C . Calculate the diameter and the length of the wire. Take $K = 0.6$, $e = 0.9$ and $\rho = 1.016 \times 10^{-6}$ ohm-meter.
- 4. Attempt any THREE of the following :** **12**
- a) A resistance furnace operates with a heating element of resistance 10Ω connected to a 230V supply. Calculate:
 - i) Current through the element.
 - ii) Power consumed.
 - iii) Heat generated in 5 minutes.
 - b) A factory requires an electric drive for a heavy-duty conveyor system. Justify the selection of the most suitable motor, considering mechanical features and load cycles.

- c) Discuss in detail the working and applications of the diamond-type pantograph in electric traction systems.
- d) An electric motor has load variation as given below.
 - i) Torque 140 Nm for 20 minutes
 - ii) Torque 40 Nm for 10 minutes
 - iii) Torque 200 Nm for 10 minutes
 - iv) Torque 100 Nm for 20 minutesIf the speed of the motor is 720 rpm, calculate the power rating of the motor.
- e) Describe the construction and working of a salt bath furnace.

5. Attempt any TWO of the following :

12

- a) Prepare a comparative analysis of different types of lamps (fluorescent, LED, and metal halide) based on –
 - i) quality of light
 - ii) lamp efficiency
 - iii) Life of lamp
 - iv) voltage regulation
 - v) cost and
 - vi) applications.
- b) Draw and Explain the block diagram of an AC electric locomotive.
- c) Discuss the modern welding techniques
 - i) ultrasonic welding with suitable examples of its applications
 - ii) laser welding with suitable examples of its applications.

6. Attempt any TWO of the following :**12**

- a) Explain the construction and working of a radiant heating system with applications.
- b) Explain with a case study the selection and maintenance of an electric drive for elevators.
- c) A trapezoidal time curve of train consists of :
 - i) Uniform acceleration of 5 kmphps for 30 seconds
 - ii) Free running for 10 minutes
 - iii) Uniform deceleration of 6 kmphps to stop the train
 - iv) A stop time of 5 minutes.

Find the distance between the stations, average and scheduled speed.
