

IV B.Tech I Semester Regular Examinations, November – 2022**UTILIZATION OF ELECTRICAL ENERGY****(Electrical and Electronics Engineering)****Time: 3 hours****Max. Marks: 75**

*Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks*

UNIT-I

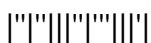
- 1 a) What do you understand by polar curves? Explain Rouseau's construction for calculating MSCP of a lamp? [7]
b) (i). With neat sketch explain the working principle of an incandescent lamp? [8]
(ii). Describe the basic principles of the control of the light.
(OR)
- 2 a) On what principle discharge lamp works? Compare its merits and demerits with incandescent lamp? [7]
b) A lamp having a candle power of 500 in all directions is provided with a reflector that directs 80% of total light uniformly on a circular area 50m diameter. The lamp is hung at 25m above the area.
(i). Calculate the illumination [8]
(ii). Calculate the illumination at the edge of the surface without reflector?

UNIT-II

- 3 a) A piece of an insulating material 2-cm thick and 120 cm² in area is to be heated by the dielectric heating. The material has a permittivity of 5 and a power factor of 0.05. The power at 800 V is 300 W. Determine the cycles per second (Frequency).? [7]
b) Explain resistance welding and its applications? [8]
(OR)
- 4 a) What is meant by induction heating? Explain the operation of vertical core type induction furnace? [7]
b) Explain the principle of spot and seam weldings? [8]

UNIT-III

- 5 a) What is load equalization? How it achieved? [7]
b) Explain the factor taken into consideration for selecting a motor? [8]
(OR)
- 6 a) Derive an expression for temperature raise of an electric motor. [7]
b) Explain starting and running characteristics of electric drive? [8]

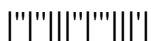


UNIT-IV

- 7 a) The distance between two stops is 1.2 km. A schedule speed of 40 kmph is required to cover that distance. The stop is of 18-s duration. The values of the acceleration and retardation are 2 kmphp and 3 kmphp, respectively. Then, determine the maximum speed over the run. Assume a simplified trapezoidal speed-time curve. [7]
- b) What is meant by specific energy consumption? Mention the factors effecting Specific energy consumption? [8]
- (OR)
- 8 a) What are the factors which affecting scheduled speed of a train? [7]
- b) An electric train of weight 250 ton has eight motors geared to driving wheels, each is 85 cm diameter. The tractive resistance is of 50/ton. The effect of rotational inertia is 8% of the train weight, the gear ratio is 4:1, and the gearing efficiency is 85% determine. The torque developed by each motor to accelerate the train to a speed of 50 kmph in 30 s up a gradient of 1 in 200. [8]

UNIT-V

- 9 a) Explain the characteristics of energy storage techniques? [7]
- b) Write short notes on pumped hydro storage system? [8]
- (OR)
- 10 a) Explain the need for energy storage system? [7]
- b) Describe flywheel energy storage system? [8]



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UNIT-I

- 1 a) Explain the following terms: [7]
 (i). Luminous flux
 (ii). Luminous intensity
 (iii). Illumination
- b) Four lamps 25m apart are arranged to illuminate a corridor. Each lamp is suspended at a height of 10m above the floor level. If each lamp gives 500CP in all directions below the horizontal, find the illumination at second and third lamp? [8]

(OR)

- 2 a) Describe the construction and working principle of a sodium vapour lamp? [7]
- b) Define the following terms: [8]
 (i). Mean horizontal candle power
 (ii). Mean spherical candle power
 (iii). Mean hemispherical candle power
 (iv). Luminous flux

UNIT-II

- 3 a) What is meant by resistance heating? What are the classifications of the resistance heating? Explain clearly? [7]
- b) Compare AC and DC weldings? [8]

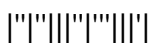
(OR)

- 4 a) Explain the following terms. [7]
 (i). Pinch effect.
 (ii). Convection.
 (iii). Radiation
 (iv). Conduction.

- b) What are the differences between resistance welding and Arc welding? [8]

UNIT-III

- 5 a) Compare group drives and individual drives? [7]
- b) (i). Explain the characteristics of DC shunt motor? [8]
 (ii). Explain the characteristics of DC series motor?



(OR)

- 6 a) Discuss the advantages and the disadvantages of the electrical drive over the other drive? [7]
b) Explain various speed control methods of DC motors? [8]

UNIT-IV

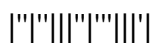
- 7 a) Derive an expression for Trapezoidal speed-time curve? [7]
b) Explain the following terms. [8]
(i). Dead weight
(ii). Coefficient of adhesion.
(iii). Adhesive weight.
(iv). Accelerating weight.

(OR)

- 8 a) An electric train has quadrilateral speed-time curve as follows: [7]
(1). Uniform acceleration from rest at 1.5 kmphs for 25s.
(2). Coasting for 45 s.
(3). The duration of braking 20 s.
If the train is moving a uniform up gradient of 1.5%, the reactive resistance is 45 N/ton, the rotational inertia effect is 10% of dead weight, the duration of stop is 15s, and the overall efficiency of transmission gear and motor is 80%. Find schedule speed.
b) Explain the following terms. [8]
(i) Tractive effort.
(ii) Breaking retardation.
(iii) Specific energy consumption.
(iv) Tractive resistance.

UNIT-V

- 9 a) What are the technical and economical advantages of energy storage? [7]
b) Explain working of compressed air energy storage system? [8]
(OR)
10 a) What are the types of electricity storage systems? [7]
b) Explain the comparison of the different storage techniques [8]



Code No: R194102A

R19

Set No. 3

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UNIT-I

- 1 a) Explain the measurement technique for luminous intensity? [7]
b) Compare the performance of tungsten filament lamps and fluorescent lamps? [8]

(OR)

- 2 a) Discuss the inverse square law and the cosine cube law of illumination. [7]
b) The luminous intensity of a source is 900 candela is placed in the middle of a 12 x 8 x 4m room. Calculate the illumination [8]
(i) At each corner of the room
(ii) At the middle of the 10m wall

UNIT-II

- 3 a) What are the essential requirements of good heating element? explain briefly? [7]
b) List out the equipment used for welding operations? [8]

(OR)

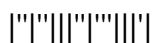
- 4 a) Compare resistance heating and induction heating? Mention applications of induction heating? [7]
b) Explain various types of Arc welding processes? [8]

UNIT-III

- 5 a) Explain how would estimate the rating of motor for the intermittent duty cycle. [7]
b) Explain how the maximum torque can be obtained at the time of starting of a three-phase slip ring induction motor? [8]

(OR)

- 6 a) Discuss the various factors that govern the size and the rating of a motor for particular service. [7]
b) Explain the different types of industrial loads? [8]

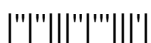


UNIT-IV

- 7 a) The distance between two stops is 5 km. A train has schedule speed of 50 kmph. The train accelerates at 2.5 kmphs and retards 3.5 kmphs and the duration of stop is 55 s. Determine the crest speed over the run assuming trapezoidal speed-time curve. [7]
- b) What is meant by Tractive Effort (Ft)? Show that $F_t = 2 \cdot \eta \cdot r \cdot (T/D) \cdot N$. [8]
(OR)
- 8 a) What are the various types of services available in traction system? Explain briefly. [7]
- b) A tram car is equipped with two motors that are operating in parallel, the resistance in parallel. The resistance of each motor is 0.5 ohms. Calculate the current drawn from the supply mains at 450 V when the car is running at a steady-state speed of 45 kmph and each motor is developing a tractive effort of 1,600 N. The friction, windage, and other losses may be assumed as 3,000 W per motor. [8]

UNIT-V

- 9 a) Explain latent-fusion-heat thermal energy storage? [7]
- b) Write short notes on comparison of energy storage technologies? [8]
(OR)
- 10 a) Write short notes on energy storage in super capacitors? [7]
- b) Explain the limitations of standard electrochemical accumulators? [8]



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R19

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UNIT-I

- 1 a) (i). Discuss various sources of illumination? [7]
(ii). List out the properties should be possessed by a good filament material?
b) Two lamps hung at a height of 12m from the floor level. The distance [8]
between the lamps is 8m. Lamp one is of 250 CP. If the illumination on
the floor vertically below this lamp is 40 lux, find the CP of the second
lamp?

(OR)

- 2 a) Define (i). Luminous intensity, I (ii). Illumination, E (iii). Brightness, L. [7]
Write the relation between I, E, and L?
b) What is stroboscopic effect? How it can be prevented in fluorescent [8]
lamps?

UNIT-II

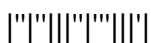
- 3 a) What are the advantages of Electric heating? And mention the causes of [7]
the failure of heating element?
b) What are the types of resistance welding? Explain briefly. Why AC [8]
supply is more suitable for resistance heating?

(OR)

- 4 a) Explain the principle of dielectric heating? And mention the [7]
applications of the dielectric heating?
b) What are the advantages, disadvantages and applications of electric [8]
welding?

UNIT-III

- 5 a) Explain different types of electric drives? [7]
b) Compare and contrast slip ring and squirrel cage IM from application [8]
viewpoint.



(OR)

- 6 a) What are the various speed control methods of DC motors? [7]
b) A 40KVA, 440V, 3- ϕ and 50Hz squirrel cage IM has full load slip of 5%. Its standstill impedance is 0.7Ω /phase. It is started using a tapped autotransformer. Calculate the tap position and the ratio of starting torque to full load torque. If the maximum allowable supply current at the time of starting is 100A. [8]

UNIT-IV

- 7 a) Derive an expression for quadrilateral speed-time curve? [7]
b) Explain the following terms. [8]
(i). Tractive effort.
(ii). Coefficient of adhesion.
(iii). Adhesive weight.
(iv). Accelerating weight.

(OR)

- 8 a) With the help of the diagram, explain speed-time curve for main line service? [7]
b) A 250-ton motor coach having four motors each developing 6,000 N-m torque during acceleration, starts from rest. If the gradient is 40 in 1,000, gear ratio is 4, gear transmission efficiency is 87%, wheel radius is 40 cm, train resistance is 50 N/ton, the addition of rotational inertia is 12%. Calculate the time taken to attain a speed of 50 kmph. [8]

UNIT-V

- 9 a) Explain briefly sensible heat thermal energy storage? [7]
b) Write short notes on different types of energy storage techniques? [8]
(OR)
- 10 a) Write short notes on superconducting magnetic energy storage? [7]
b) Explain briefly the electro chemical reaction? [8]

