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B.TECH
(SEM VII) THEORY EXAMINATION 2021-22
UTILIZATION OF ELECTRICAL ENERGY & ELECTRIC TRACTION

Time: 3 Hours**Total Marks: 100****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

- a. Explain conduction mode of heat transfer?
- b. How is control of power affected in electric air arc furnaces?
- c. Define the term electric welding.
- d. What are the various current collection systems?
- e. Why is tungsten selected as the filament material?
- f. State and explain refrigeration process.
- g. Give examples of various traction systems in daily life.
- h. What is meant by schedule speed of a train?
- i. Why the magnetic circuit of a traction motor is not made of cast iron?
- j. State the significant features of traction drives.

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

- a. Explain the working of arc furnaces and describe with the help of a sketch the construction and working of any one type of arc furnace.
- b. Explain arc blow effect at the edges and due to ground currents. What are the advantages of using coated welding electrodes?
- c. Define air conditioning. On what factor does the air conditioning depends? Explain in detail.
- d. The distance between two stops is 1.4 Km. A Schedule speed of 50 kmph is required to cover that distance. The stop is of 20-s duration. The values of the Acceleration and retardation are 2 kmphp and 3 kmphp, respectively. Then, Determine maximum speed over the run. Assume a simplified trapezoidal speed-time curve.
- e. Explain the theory, working and characteristics of linear induction motor for traction purposes.

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Explain the method of induction heating and describe coreless type of induction furnace.
- (b) What is dielectric heating? Explain the factors on which the dielectric loss in a dielectric material depends.

4. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Draw a neat sketch of a spot welding machine and describe its construction and working in detail.



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- (b) It is required to repair a worn out circular shaft 15 cm in diameter and 32 cm long by coating it with a layer of 1.6 mm of nickel. Determine the theoretical value of quantity of electricity required and time taken if the current density used is 210 A/m^2 . Electro-chemical equivalent of Nickel is $30.4 \times 10^{-8} \text{ Kg/C}$ of electricity and density of Nickel is $8.9 \times 10^3 \text{ Kg/m}^3$.

5. Attempt any *one* part of the following:

10 x 1 = 10

- (a) Explain the working of a fluorescent tube with the help of the circuit diagram giving the function of various parts.
- (b) A room with an area of $6 \times 9 \text{ m}$ is illustrated by ten 80-W lamps. The luminous efficiency of the lamp is 80 lumens/W and the coefficient of utilization is 0.65. Find the average illumination.

6. Attempt any *one* part of the following:

10 x 1 = 10

- (a) What is tractive effort of a train and what are its functions? Derive an expression for the tractive effort developed by a train unit.
- (b) What are the advantages of single-phase low frequency system of track electrification? What are the factors due to which its wide spread application remains limited?

7. Attempt any *one* part of the following:

10 x 1 = 10

- (a) Discuss the problem associated with diesel-electric traction and indicate how these are overcome in practice.
- (b) How direction of rotation of a traction motor is reversed? Explain the working principle of metadyne control of traction motor. Also discuss its merits and demerits.