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B. Tech 6th Semester Examination

Electrical Energy Utilization (EE/EEE)

EE-6004

Time : 3 Hours   Max. Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt Five questions in all, selecting at least one question from each Section A, B, C & D and all short questions from Section E.

SECTION - A

1. (a) Discuss about various traction systems used in India. Explain the speed time curve used for train movement in details.

   (b) Discuss the criterion for the selection of the motor drive.
   (10+10=20)

2. (a) Explain electric braking by plugging. Why shunt motor connections are reversed for armature in case?

   (b) A 3-phase, 400 V, 50 Hz, 8-pole, star-connected induction motor has the following parameters: $R_1 = 0.1\Omega$, $R_2 = 0.5\Omega$, $X_1 = 0.6\Omega$, $X_2 = 2.4\Omega$, $s_f = 0.05$ and the ratio of effective stator to rotor turns 0.5. The motor is to be braked at rated speed and an external resistance of 2Ω per phase (referred to stator) has been inserted into the rotor circuit. Determine the initial braking torque in (i) plugging and (ii) dc dynamic braking.   (10+10=20)

SECTION - B

3. (a) Define:

   (i) Mean spherical Candle power (ii) Mean horizontal Candle power (iii) Mean hemispherical Candle power (iv) Luminous flux (v) Lamp efficiency.

   (b) Explain the different types of lamp fittings and lighting systems with the help of light distribution graphs.

   (10+10=20)

4. (a) State and explain laws of Illumination.

   (b) Two similar lamps having uniform intensity of 500 candle power in all directions below the horizontal are mounted at a height of 4 meters. What should be the maximum spacing between the lamps so that the illumination on the ground midway between the lamps shall be at least one half the illumination directly under the lamps?

   (10+10=20)

SECTION - C

5. (a) Discuss working principle of electric arc furnace. Discuss how is dielectric arc furnace different from the indirect arc-furnace.

   (b) The power required for dielectric heating of a slab of resin 150 cm^2 in area and 2cm thick is 200 watts with frequency of 30MHz. The material has a relative permittivity of 5 and pf of 0.05. Determine the voltage necessary and current flowing through the material. If the voltage is limited to 600V, what will be the value of the frequency to obtain the same heating?   (10+10=20)

6. (a) What are the different types of heating? Give advantages of electric heating.

   b) Discuss the principle involved in induction heating. Enumerate various characteristics of induction heating.

   (10+10=20)

SECTION - D

7. (a) Explain different types of control equipment used for controlling the temperature and pressure in arc and resistance welding.

   (b) Describe the following welding processes.

   (i) Atomic hydrogen welding. (ii) Laser welding.

   (10+10=20)

8. (a) Differentiate between a.c and d.c welding. Enumerate advantages of coated electrodes in welding process.

   (b) Explain the construction and working of a welding transformer. How does it differ from an ordinary transformer. (10+10=20)

SECTION - E

9. Attempt all questions.

   (a) Define coefficient of Adhesion. What is its nominal value?

   (b) What are polar curves? Distinguish between vertical and horizontal polar curves.

   (c) Discuss the objectives of having street lighting.

   (d) Give advantages of Pantograph current collector in an electric traction.

   (e) What are the power supply problems in electric heating?

   (f) Give advantages of regenerative braking.

   (g) What is tractive effort?

   (h) Define solid angle.

   (i) Give a brief account of air-blast circuit breaker.

   (j) Explain dead weight and accelerating weight.

   (10×2=20)