Exam. Code: 0933
Sub. Code: 6657

2074

B.E. (Electrical and Electronics Engineering)

Third Semester

PC-EE-302: Electrical Machine - I

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: ***Attempt five questions in all, including Question No. 1 (Section-A) which is compulsory and selecting two questions each from Section B-C. All questions carry equal marks.***

x-x-x

Section -A

1. Write briefly
   a) Why core of transformers is made with silicon steel laminations.
   b) Why SC test on a transformer is not done at rated voltage.
   c) Derive induced EMF equation in DC machine.
   d) Describe concept of generation of rotating magnetic field in three phase induction machine.
   e) Describe concept of double revolving field theory in single phase induction machine.

Section-B

2. A 110 KVA, 1-phase transformer has a ratio of 11000/440 V. The iron loss measured on open circuiting 440 V side is 1100 W with excitation current of 0.5 A. With the secondary winding short circuited, a voltage of 500 V at normal frequency applied to the primary produces full load current at a wattmeter reading of 1000 W. Calculate
   a) the secondary terminal voltage.
   b) the efficiency, when a current of 250 A at a lagging power factor of 0.8 is taken by a load connected to the low voltage terminals, the primary voltage being 11000 volts.

3. A DC shunt motor is fed with a 250 V supply. The shunt field winding resistance is 100 Ω and armature resistance is 0.25 Ω. The motor draws 75 A of armature current at a speed of 1000 rpm. It is desired to run the machine at 700 rpm with torque requirement of one-half of that at 1000 rpm. This is effected by putting a resistance in series with the supply. Determine:
   a) The value of resistance to be connected for the above condition.
   b) The current in the field and armature for the new condition.

4. A series motor supplied with a 500 V battery runs at a speed of 800 rpm, when the load is such that the current is 120 A. The load torque is removed and the motor is subjected to plugging operation. Assuming that the motor is operating in linear magnetic region. The machine has total resistance of 0.2 Ω. Determine:
   a) The value of the external resistance to be inserted during plugging to limit the maximum current during plugging at 120 A.
   b) The value of the braking torque at the moment of plugging and when the machine reaches zero speed.

Section-C

5. A 440 V, 3-phase, 50 Hz, 6 pole, 945 rpm, delta connected induction motor has the following parameters referred to the stator: $R_s = 2\ \Omega$, $R_r' = 2\ \Omega$, $X_s = 3\Omega$, $X_r' = 4\ \Omega$, $X_m = 100\ \Omega$. When driving a load whose torque varies linearly with speed, at rated voltage it runs at rated speed. If the motor speed is controlled using stator voltage control.
   a) Motor terminal voltage, current and torque at 800 rpm.
   b) Motor speed, current and torque for the terminal voltage of 280 V.

P.T.O.

6. The test data on a 208-V, 60-Hz, 4-pole, Y-connected, three-phase induction motor rated at 1710 rpm are as follows:

	No Load Test	Blocked Rotor Test
Power Input	450 W	59.4 W
Line Current	1.562 A	2.77 A
Line Voltage	208 V	27 V

The stator resistance (dc) between any two terminals = 2.4 Ω. Evaluate the equivalent circuit parameters of the induction motor and draw its per phase equivalent circuit with respect to the stator. Also evaluate the maximum value of the torque that the machine can supply. At what speed this maximum torque is generated?

7. Write Short Notes on the following

a) Permanent split capacitor motor.

b) Shaded pole motor.