

(3 Hours)

Total Marks: 80

**N.B: (1) Question No. 1 is compulsory.****(2) Attempt any three from the remaining questions.****(3) Figures to the right indicate full marks.****(4) Each question is of 20 Marks.****Q1. Answer ANY FOUR.**

- a) List down the conditions to be fulfilled for successful parallel operation of transformers. **05**
- b) Explain torque speed characteristics of an induction motor. **05**
- c) Whether a single phase induction motor is self-starting, justify your answer. **05**
- d) With neat diagrams explain Dd6 and Dy1 connections. **05**
- e) Derive relation between starting torque and full load torque for three phase Induction motor. **05**

**Q 2**

- a) Two three phase transformers connected in parallel supply a load requiring an active power of 700 kW and lagging reactive power of 715 kVAR. Transformer 1 is rated at 400 KVA and has p.u. impedance of  $(0.03 + j0.08)$  while transformer 2 is rated at 600 KVA and has p.u. impedance of  $(0.02 + j0.07)$ . Determine active power shared by each transformer and operating power factor. **10**
- b) Write a short note on 'Saving of Copper in an Auto-transformer'. **10**

**Q 3**

- a) Explain various power stages in an induction motor with necessary expressions. **10**
- b) A 3 phase; 4 pole; 1440 rpm; 50 Hz induction motor has a star connected rotor with per phase rotor resistance and standstill reactance as  $0.2 \Omega$  and  $1 \Omega$  respectively. When the stator is energised with rated supply voltage at rated frequency the rotor induced e.m.f. between lines is 210V. Calculate, rotor current; power factor and torque at standstill and at full load. **10**

**Q 4**

- a) Write a short note on 'Open Delta' connection of three phase transformer. **10**
- c) An 8 pole 50 Hz, three phase induction motor runs at a speed of 720 rpm when delivering full load torque. Its rotor resistance and stand still reactance are  $0.1 \Omega$  and  $0.6 \Omega$  per phase respectively. An additional resistance of  $0.5 \Omega$  per phase is inserted in the rotor circuit to control the speed. Calculate the speed at which the motor will run now if full load torque remains same. **10**

**Q 5****15915**

- a) A 220 V, 4 pole, 50 Hz split phase induction motor has following test results: **10**

<b>Blocked rotor test:</b>	120 V	9.6 Amp.	460 Watts
<b>No load test:</b>	220 V	4.6 Amp.	125 Watts

The stator winding resistance is  $1.5 \Omega$  and during the blocked rotor test, the starting winding is open. Determine the equivalent circuit parameters. Also find core, friction and windage losses.

- b) Explain i) capacitor start & capacitor run and ii) shaded pole induction motor with neat diagrams. **10**

**Q 6 Write short note on ANY TWO of the following.**

- a) Deep bar and double cage induction motor. **10**  
 b) Oscillating neutral phenomenon in transformer. **10**  
 c) Scott connection. **10**