

Electrical Machine - I.

Con. 5373-07.

(REVISED COURSE)

(3 Hours)

[Total Marks : 100

CD-5979

MASTER

N.B. (1) Question No. 1 is compulsory.

(2) Attempt any four out of remaining.

(3) Assume any data if necessary and justify the same.

P. E. C. E. V. K. W. Elect. Machine of 12/11/14

1. (a) Derive expression for mechanical forces developed in Large transformer for- 10
 - (i) External radial forces
 - (ii) Internal axial forces.
- (b) Explain switching transient in transformer. 10

2. (a) Explain disadvantages of harmonics in transformer. 10
- (b) Explain speed control methods of dc shunt machine by armature voltage control and field flux control. 10

3. (a) A 20 kVA 2300/230 V two winding transformer is to be used as an autotransformer with constant sources voltage of 2300 V. At full load of unity power factor, calculate the power output, power transformed and power conducted, if the efficiency of the two winding transformer at 0.6 pf is 96%. Find auto transformer efficiency at the same power factor. 10
- (b) Explain armature reaction in DC machines in short. Explain the methods to reduce it. 10

4. (a) Explain the method of testing two identical dc SERIES machines. 10
- (b) Two identical dc SHUNT machines when tested by Hopkinson's method gave following data. 10
 Line voltage 230 V, line current excluding both the field currents 30A, motor armature current 230 A, field currents 5A and 4A. If the armature resistance of each machine (including brushes) is 0.025 Ω , calculate efficiency of both the machines.

5. (a) With the help of waveform show that for a sinusoidal applied voltage to a transformer, flux is a sine wave and the magnetising current due to saturation is peaky containing a pronounced third harmonic content. 10
- (b) Two 6600/440 V transformers have ratings of 250 kVA and 600 kVA resp. On short circuit test, the 250 kVA transformer requires 5% of normal voltage to circulate full load current, the power factor being 0.23. The corresponding figures for 600 kVA transformer are 4% and 0.16. How will they share a load of 680 kW at 0.8 pf lag ? 10

6. (a) Draw and explain Speed-current, Torque current and Speed torque characteristics of dc shunt and series motor. 10
- (b) A 230 V dc shunt motor has an armature resistance of 0.4 Ω and field resistance of 115 Ω . This motor drives a constant torque load and takes an armature current of 20 A at 800 rpm. If motor speed is to be raised from 800 to 1000 rpm, find the resistance that must be inserted in shunt field circuit. Assume straight line magnetisation. 10

7. (a) A dc shunt motor takes 50 A on full load from 250 V mains. Its speed is to be raised by 40% by weakening of field flux. If the torque at increased speed is 20% more than that at initial speed, find percentage of change in flux. The arm. resistance (including brushes) is 0.5 Ω . 10
- (b) Explain necessity of starter in DC motor and hence explain three point starter. What the disadvantages of three point starter ? 10