

**(3 Hours)****[Total marks: 80]**

- N.B.: (1) Question no.1 is compulsory  
(2) Attempt any three questions from remaining.  
(3) Figures to the right indicates full marks  
(4) Assume suitable data if required. Justify the same.

- Q.1** A) Explain working principal of transformer. **5**  
B) Draw tree diagram showing classification of DC Motors. **5**  
C) Differentiate two winding transformer and autotransformer. **5**  
D) State and explain losses in DC machines **5**
- Q.2** A) Explain doubly excited magnetic field. **10**  
B) The O.C and S.C test data are given below for a single phase, 5 kVA, 200V/400V, 50 Hz transformer. O.C test from LV side : 200V, 1.25A, 150W  
S.C test from HV side : 20V, 12.5A, 175W  
Draw the equivalent circuit of the transformer (i) referred to LV side and (ii) referred to HV side inserting all the parameter values. **10**
- Q.3** A) What is armature reaction? Explain its effects and remedies to reduce it. **10**  
B) An iron ring with mean diameter 8 cm is made up of round iron of diameter 1 cm and permeability of 900 has an air gap of 2 mm wide. It consists of winding with 400 turns carrying a current of 3.5 A. Determine, (i) total mmf, (ii) total reluctance, (iii) total flux and (iv) flux density in a ring. **10**
- Q.4** A) With neat diagram explain three point starter. **10**  
B) Explain Swinburne's test performed on DC shunt Motor. **10**
- Q.5** A) Explain conditions for parallel operation two transformers. Derive expression for load sharing for equal voltage ratio condition. **10**  
B) A 220 V d.c series motor has armature and field resistances of 0.15  $\Omega$  and 0.10  $\Omega$  respectively. It takes a current of 30 A from the supply while running at 1000 rpm. If an external resistance of 1  $\Omega$  is inserted in series with the motor, calculate the new steady state armature current and the speed. Assume the load torque is proportional to the square of the speed i.e.,  $T_L \propto n^2$ . **10**
- Q.6** Write Short Notes **20**  
A) Speed control of DC series motor.  
B) Sumpner's test on transformer.  
C) Back EMF and its significance