

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2051

Roll No.

--	--	--	--	--	--	--	--	--	--

B.Tech.

(SEM IV) EVEN SEMESTER THEORY EXAMINATION,
2009-2010

**ELECTROMECHANICAL ENERGY
CONVERSION - I**

Time : 3 Hours

Total Marks : 100

Note : Attempt all questions.

1. Attempt any two of the following :

- (a) Derive the expression for energy stored in the magnetic field and show that the same is equal to the area between ϕ -F curve and the flux axis. 10
- (b) Derive the expression for torque in a doubly excited system. Explain the significance of reluctance torques and co-alignment torque in the same. Also derive the expression for torque of a singly excited system from that of a doubly excited system. 10
- (c) (i) Draw neat labelled schematic diagrams to show flow of energy in electromechanical energy conversion via a coupling magnetic field, both for motors as well as for generators. 10
- (ii) Write down the voltage equation for an electromechanical device and explain the term 'speed voltage' in the same.

2. Attempt any two of the following :
- (a) Draw labelled neat sketches for the following of a DC machine. 10
 (i) Stator containing poles and winding.
 (ii) Rotor
 (iii) Brush and commutator
 (iv) Lap and Wave windings
- (b) Explain the term Armature Reaction in detail. What measures are taken to get rid of the same ? 10
- (c) Draw External characteristic of DC shunt generator and explain the method to obtain Internal characteristic from the same. 10

3. Attempt any two of the following :
- (a) Draw $N-I_a$ and $T-I_a$ curves for DC series and DC shunt motors. From these curves, obtain the $N-T$ curves for both the machines. 10
- (b) Draw and explain the three point starter for DC motors. Which of its short coming is overcome in the four point starter and how ? 10
- (c) Describe Hopkinson's test in detail. 10

4. Attempt any two of the following :
- (a) Discuss about the Y- Δ connection and open delta connection in detail. What are their relative advantages and disadvantages ? Give their applications also. 10
- (b) Describe the construction of three phase (unit type and Bank type) transformers and compare them. 10

- (c) A scott connection transformer supplies two single phase furnaces at 100 V, each taking 200 kW. The load on the leading phase is at UPF and that on the other phase is 0.8 p.f. lagging. The 3 phase line input voltage is 11,000 volt. Calculate the line currents on primary side. Neglect the magnetizing current and leakage impedance. Draw the phasor diagram. 10

5. Attempt any four of the following :
- (a) An 11500/2300 volt two winding transformer operates at rated 100 kVA. If its windings are connected in series to form an autotransformer, what will be the voltage ratio at the output ? Also calculate the saving in conductor material. Take the output from 11500 volt side. 5
- (b) A 2300/230 V, 500 kVA, 50 Hz transformer has core loss of 1600 W and copper loss of 7.5 kW at full load. During a day, its loading was as follows. 5

%load	0%	20%	50%	80%	100%	125%
P.F.	-	0.7 lag	0.8 lag	0.9 lag	UPF	0.85 lag
Hours	2	4	4	5	7	2

Determine the All Day efficiency of the transformer.

- (c) A 500 kVA transformer with 0.01 pn resistance and 0.05 pn reactance is connected in parallel with a 250 kVA transformer with 0.015 pn resistance and 0.04 pn reactance. The secondary voltage of each transformer is 400 volt on no load. How would they share a load of 750 kVA at 0.8 p.f. lagging. 5

- (d) Write a detailed note on excitation and harmonic phenomenon in a three phase transformer. 5
- (e) Why is Sumpner's test performed on transformers? Discuss in detail about this test with connection diagram. 5
- (f) Compare an autotransformer with a two winding transformer on their operation, advantages, disadvantages and applications. 5

- o O o -