Paper Code: EE- 301	**Roll No.**									

B.Tech.
THIRD SEMESTER EXAMINATION, 2016-17
ELECTROMECHANICAL ENERGY CONVERSION - I

[Time: 3 hrs.] [Max. Marks: 100]

Note: Attempt ALL questions. Assume suitable data, if required. All question carry equal marks.

1. Attempt any TWO of the following:- **(10x2=20)**

(a) From fundamentals, explain the concept of electromagnetic energy conversion in rotating electrical machines.

(b) Give complete analysis of energy and coenergy in case of singly excited system when the rotor moves slowly. Also show that the electromagnetic torque is directly proportional to the rate of change of inductance with respect to the angle of rotational movement. State the assumptions made.

(c) Derive the expression of torque for a doubly excited electromagnetic system. What are the "Saliency" and "Co-alignment" components in this expression?

2. Attempt any TWO of the following:- **(10x2=20)**

(a) The following data were obtained when a short circuit test was performed upon a 100 kVA, 2400/240 V distribution transformer.
V_{SC} = 72 V, I_{SC} = 41.6 A, P_{SC} = 1180 W.
Calculate
a) the equivalent R,X and Z.
b) the percentage regulation at 0.75 lagging power factor
c) the amount of load at 0.71 power factor for which the copper loss is 1500 W.

(b) Using connection diagram, explain step by step the back to back test performed on two identical transformers. Why is this test performed? What are the merits and demerits of this test?

(c) Explain dot convention in relation to polarity test in a single phase transformer.
A single phase 11,500 / 2300 V transformer is rated at 100 kVA. Place the dots appropriately and show the connections of the four possible combinations that can be obtained by putting the two windings in series?

3. Attempt any FOUR of the following:- **(5x4=20)**

(a) Draw the labeled connection diagram and corresponding phasor diagram to explain the Scott connection of transformers. What is the purpose of making such a connection?

(b) What do you understand by grouping of three phase transformers? How is a phase displacement shown by the clock hour number?

(c) Explain the ways of obtaining 6-phase and 12-phase connections from a 3-phase supply and give their applications.

(d) Discuss "Excitation Phenomenon" in Transformers with suitable waveforms.

(e) Give conditions for satisfactory parallel operation of three phase transformers.

(f) Show that the VA rating of open-delta transformer is reduced to 58% of normal delta/delta connection.

4. Attempt any FOUR of the following:- **(5x4=20)**

(a) Derive expressions of emf developed in a DC generator and of the torque developed in a DC motor.

(b) Explain the process of commutation with the help of simple coil- commutator segment diagrams.

(c) Write a brief note on armature winding.

(d) Write a brief note on compound DC machine based on electrical connections and magnetic effects of the field windings.

(e) Write a brief note on armature reaction.

(f) Draw connection diagram for Hopkinson's Test and briefly explain the same.

5. Attempt any TWO of the following:- **(10x2=20)**

(a) A DC shunt generator delivers 40 kW at 250 V and 500 rpm. The armature and field resistances are 0.02 ohm and 50 ohms respectively. Calculate the speed of the machine running as shunt motor and taking 40 kW input at 250V. Allow 1 V drop per brush.

(b) A 220 V shunt motor has an armature resistance of 0.6 ohm and takes a current of 30 A on full load. By how much must the main flux be reduced to raise the speed by 60% if the developed torque remains constant?

(c) What do you understand by constant power and constant torque regions of speed control? Draw a neat diagram of Ward Leonard method of speed control. Discuss about its merits and demerits.