

GUJARAT TECHNOLOGICAL UNIVERSITY**B.E. Sem-III Regular / Remedial Examination December 2010****Subject code: 131701****Subject Name: Electrical Machines****Date: 16 /12 /2010****Time: 10.30 am – 01.00 pm****Instructions:****Total Marks: 70**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** Derive the e.m.f. equation of a 1-phase transformer. **07**
The core of a 150 kVA, 11000/440 V, 50 Hz, 1-phase core type transformer has a cross section of 20*20 cm. The maximum core density is not to exceed 1.3 wb/m². Find (i) the number of h.v. and l.v. turns per phase.
- (b)** Discuss the tests to find out the iron loss and copper loss in a transformer with justifications. **07**
- Q.2 (a)** Discuss open delta connections of transformers with necessary circuit and vector diagrams. **07**
- (b)** Define regulation of a transformer. Compare conventional and instrument transformers. **07**

OR

- (b)** Two 1-phase furnaces working at 100 V are connected to 3300 V, 3-phase supply through Scott connected transformers. Calculate the current in each line of 3-phase mains when the power taken by each furnace is 450 kW at a power factor of 0.8 lagging. Neglect the losses in transformers. **07**
- Q.3 (a)** Differentiate between singly excited and multi-excited field systems. Derive the expression for the mechanical force in a current excited system. **07**
- (b)** Explain the phenomena of crawling and cogging in a 3-phase induction motor with their remedies. **07**

OR

- Q.3 (a)** Differentiate between cage and slip ring induction motor. Explain how the torque is developed in a 3-phase induction motor. **07**
- (b)** Draw the circle diagram for a 3-phase, 29.84 kW, 415 V, 50 Hz, delta-connected induction motor from the following data: **07**
No-load test: 415 V; 21 A; 1250 W
Blocked rotor test: 100 V; 45 A; 2730 W
Estimate from the diagram for full load condition, the slip, efficiency and power factor. The rotor copper loss at standstill is half of the total copper loss.
- Q.4 (a)** What is slip of a 3-phase induction motor? Discuss its slip-torque characteristics. **07**
- (b)** Why a 1-phase induction motor is not self starting? Explain working of split phase type 1-phase induction motor **07**

OR

- Q.4 (a)** Define salient pole and non-salient pole machines. Why is armature winding of a synchronous machine stationary? **07**
- (b)** What is synchronisation of alternators? Which conditions must be satisfied for proper synchronisation of 3-phase alternators? **07**
- Q.5 (a)** Compare field control and armature voltage control methods of speed control of a DC motor. **07**
- (b)** Explain the phenomena of armature reaction in a DC machine. State its remedies. **07**

OR

- Q.5 (a)** Draw schematic diagram of a dc machine with labels. State the functions of (i) pole shoe, (ii) commutator and (iii) yoke. **07**
- (b)** Differentiate between self-excited and separately-excited dc machines. Draw the load characteristic of dc shunt and series generator. **07**
