

GUJARAT TECHNOLOGICAL UNIVERSITY**B. E. Sem. - V - Examination – June- 2011****Subject code: 150901****Subject Name: Electrical Machine - II****Date: 20/06/2011****Time: 10:30 am – 01:00 pm****Total Marks: 70****Instructions:**

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

- Q.1 (a)** Explain with reasons what happens when : **06**
- (i) The ends of rotor conductors of a squirrel cage induction motor, are kept open
 - (ii) In a 3-phase induction motor, the connections of any two phases are interchanged?
 - (iii) If a 3-phase induction motor gets one of its 3-phase opened? how will this be indicated?
 - (iv) The 3-phase supply to the induction motor becomes unbalanced?
 - (v) The supply voltage to the 3-phase induction motor becomes too high [say 600V]
 - (vi) The supply voltage to the 3-phase induction motor becomes too high [say 200V]
- (b)** Justify the correctness of the following statements **06**
- (i) A single phase induction motor, If provided with a three phase slip ring type rotor connected to a starting resistance, results in a large starting torque
 - (ii) Single-phase induction motor must have two starting winding.
 - (iii) Reversal of rotation of single phase I.M. is never a problem
- (c)** List the different methods of starting an induction motor **02**
- Q.2 (a)** Explain construction of welding transformer. How does it differ from power transformer **07**
- (b)** Explain with necessary diagrams how two 1-phase transformer can be used to convert a 3-phase supply to a 2-phase one. If the load is balanced on one side, show that it will be balanced on other side. **07**
- OR**
- (b)** Where is the delta-delta connection is applied? **07**
- A 3-phase transformer has its primary connected in delta and secondary in star, it has an equivalent resistance of 1% and equivalent reactance of 6%. The primary applied voltage is 6,600V. what must be the ratio of transformation in order that it will deliver 4800V at full load current and 0.8 power factor lag.
- Q.3 (a)** Two 3-limb, 3-phase delta-star connected transformers are supplied from the same source. one of the transformer is DY1 and the other is DY11 connection. What would be the phase difference of the corresponding phase voltage of the secondaries. Also explain how a 3-phase transformer Yd11 of Group no. 04 can be successfully operated in parallel with an other transformer DY1 of group no. 3 **07**
- (b)** Draw the phasor diagram and equivalent circuit of a 3-phase induction motor. **07**

OR

- Q.3 (a)** Two-transformers are connected in open delta and supply a balanced 3-phase load of 240 KW at 400volts and a P.F of 0.866 determine **07**
 a] The secondary line current
 b] The KVA load on each transformer
 c] The power delivered by the individual transformer.
 If a third transformer having the same rating as each of the other two is added to form a delta bank. What total load can be supplied.
- (b)** How is high starting torque obtained by deep bar and double cage rotor construction? Describe their construction. Also draw the equivalent circuit diagram of double cage Squirrel cage induction motor **07**
- Q.4 (a)** Two single phase scott-connected transformers supply a 3-phase 4-wire 50Hz distribution system with 400V between lines. The h.v windings are connected to a 2-phase 6000 V (per phase) system. The core area is 250cm^2 . While the maximum allowable flux density is 1.2 T. Determine the point to be tapped for the neutral wire on the 3-phase side. **07**
- (b)** Differentiate between harmonic induction torque and harmonic synchronous torque developed in a induction motor. what are their effects **07**
- OR**
- Q.4 (a)** An ac operated universal motor has a 2-pole armature with 960 conductors. At a certain load the motor speed is 5000 rpm and the armature current is 4.6A; the armature terminal voltage and input are respectively 100 V and 300 W. Calculate the following quantities assuming an armature resistance of $3.5\ \Omega$. (i) Effective armature reactance (ii) Max. value of useful flux/pole **07**
- (b)** In a back-to-back test, show that one transformer may have less temperature rise than the other. In sumpner's test, the frequency of voltage injected in the secondary circuit may not be equal to the rated frequency. explain. **07**
- Q.5 (a)** How can an induction generator feed power into a constant frequency bus? Give circuit configuration only. Also draw approximate equivalent circuit diagram and phasor diagram of induction generator. **07**
- (b)** Discuss how the speed and power factor of a schrage motor can be varied by an emf injected into its secondary winding. Compare the frequency of the emf induced in and injected into secondary winding. **07**
- OR**
- Q.5 (a)** Why are the compensating winding and the interpole winding used in a universal motor for a.c operation . draw the schematic connection diagram for all the stator windings and the armature for ac-operated series[universal] motor **07**
- (b)** Draw the circle diagram of a 20 h.p, 400V, 50Hz, 3-phase star-connected induction motor from the following test data (line values) **07**
 No load 400v 9A p.f 0.2
 Block rotor 200v 50A p.f 0.4
 From the circle diagram find [i] line current and p.f at full load
 [ii] maximum power out put
