

GUJARAT TECHNOLOGICAL UNIVERSITY**B. E. Sem. - V - Examination – June- 2011****Subject code: 150802****Subject Name: Electrical Machine - II****Date: 27/06/2011****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) Define the following terms using supporting diagram
Pole pitch, Coil pitch, Front pitch, Back pitch and Commutator pitch **05**

(b) Explain in brief about the techniques to improve the commutation in DC machine. **04**

(c) Explain the construction, operation and equivalent circuit of double cage induction motor. **05**

Q.2 (a) Using double field revolving theory, discuss in detail why single phase induction motor is not self starting. **07**

(b) Draw the developed view diagram of lap winding for 4 poles and 12 slots armature with two coil sides per slot. **07**

OR

(b) Discuss in detail about the cogging and crawling phenomena for three phase induction motor. **07**

Q.3 (a) Using circle diagram method, determine **07**

(i) Full load current & power factor (ii) Maximum possible output power, for the given data.

3 phase, 20 HP, 440 Volt, 50Hz, 4 pole Induction motor

No load test: 440 V, 10 A, 1.5 kW

Blocked rotor test: 120 V, 30 A, 2.25 kW

(b) Discuss construction, phasor diagram and torque-speed characteristics for the following single phase motors: **07**

- i. Split phase
- ii. Capacitor start
- iii. Shaded pole

OR

- Q.3** (a) Discuss the construction and operation of permanent magnet brush less DC motor. **07**
- (b) Draw the following vector groups of three phase transformer winding connection **07**

Yy0, Dd6, Dy1, Yd11, Dd0

- Q.4** (a) Two shunt machines connected for Hopkinson's test take 15A at 200 V from the supply. The motor current is 100 A and shunt currents are 3 A and 2.5 A. If the armature resistance of the each machine is 0.05 Ω . Calculate the efficiency of each machine for this particular load condition. **07**
- (b) Discuss the construction, operation and speed control for the Universal motor **07**

OR

- Q.4** (a) A 400 kVA load at 0.7 power factor lagging is supplied by three single phase transformers connected in Δ - Δ each. Each transformer is rated at 200 kVA, 2300/230 V. If one defective transformer is removed from service, calculate for the V-V connection, **07**

(a) The kVA load carried by each transformer. (b) Percent rated load carried by each transformer. (c) Total kVA ratings of transformer bank in V-V. (d) Ratio of V-V bank to Δ - Δ bank transformer ratings. (e) Percent increase in load on each transformer when one transformer is removed.

- Q.4** (b) Draw the equivalent circuit of the synchronous motor and explain its operation under the various excitation conditions using phasor diagram **07**

- Q.5** (a) Derive the expression for the power developed by the synchronous motor **07**
- (b) What are the desirable starting conditions for a three phase induction motor? With the neat schematic arrangement discuss star-delta starter. **07**

OR

- Q.5** (a) Explain the operation of single stack variable reluctance type stepper motor. Also discuss about the micro stepping. **07**

- (b) A 1000 kVA, 11000 V, 3-phase star connected synchronous motor has an armature resistance and reactance per phase of 3.5 Ω and 40 Ω respectively. Determine the induced e.m.f. and angular retardation of rotor when fully loaded at (i) unity power factor, (ii) 0.8 power factor lagging (iii) 0.8 power factor leading. **07**
