Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- Vth SEMESTER–EXAMINATION – MAY/JUNE - 2012

Subject code: 152404 Date: 05/06/2012

Subject Name: Electro Mechanical Energy Conversion - II

Time: 02:30 pm – 05:00 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 the excitation phenomena of the magnetic material. Draw the waveforms of voltage, flux, exciting current and corresponding hysteresis loop. **07**

(b) Explain in detail the operation of 3-Φ induction motor with unbalanced source voltages. **07**

Q.2 **(a)** A 1000-kVA, 11000-V, 3-Φ, 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 the rotor when fully loaded at (i) unity p.f. (ii) 0.8 p.f. lagging. **07**

(b) Explain the effect of variation in excitation on the power factor and armature current of synchronous motor. Draw "V-Curves" and "Inverted V-Curves" for different loads. **07**

OR

(b) Draw the equivalent circuit of synchronous motor. With the help of vector diagram explain the effect of increased load on a synchronous motor when excitation is kept constant. **07**

Q.3 **(a)** With the help of the double field recovering theory prove that single-phase induction motor is not self starting. **07**

(b) Explain the single value capacitor-start capacitor-run single-phase induction motor. Draw the arrangement for making it reversible. **07**

OR

Q.3 **(a)** Explain the repulsion principle with necessary diagrams. List drawbacks of repulsion motor. **07**

(b) Explain the single-phase ac series motor in detail. **07**

Q.4 **(a)** Explain Linear Induction Motor and Magnetic Levitation. **07**

(b) Explain construction, working and characteristics of permanent magnet dc motor. List its advantages, disadvantages and applications. **07**

OR

Q.4 **(a)** Explain construction and working of switched reluctance motor. List its advantages, disadvantages and applications. **07**

(b) Define step angle. Explain construction of variable reluctance stepper motor. Explain full-step and 2-phase-ON operation. **07**

Q.5 **(a)** List the conditions for parallel operation of single-phase and three-phase transformers. Discuss its importance. **07**

(b) In a Scott-connection, calculate the values of line currents on the 3-phase side if the loads on the 2-phase side are 300-kW and 450-kW both at 100 V and 0.707 p.f. (lagging) and the 3-phase line voltage is 3300 V. The 300-kW load is on the leading phase on the 2-phase side. Neglect transformer losses. Draw the connection and vector diagram. **07**

OR

Q.5 **(a)** Explain the Scott connection of transformers with neat vector diagrams. **07**

(b) A 120-kVA, 6000/400-V, Y/Y 3-Phase, 50-Hz transformer has an iron loss of 1600 W. The maximum efficiency occurs at ¾ full load. Find the efficiencies of the transformer at (i) full-load and 0.8 power factor (ii) half-load and unity power factor (iii) maximum efficiency. **07**

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