Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV • EXAMINATION – WINTER • 2014

Subject Code: 142401 **Date: 22-12-2014**

Subject Name: Electro Mechanical Energy Conversion - I

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)**	State the principle of DC Generator. Enlist the various parts of the DC Machine and explain any three parts in detail.	**07**
	(b)	Explain the torque – speed characteristics of DC shunt motor.	**07**
Q.2	**(a)**	Explain the working principle of 1-phase transformer.	**07**
	(b)	An 11000 / 230 V, 150-kVA, 1-phase, 50-Hz transformer has core loss of 1.4kW and full load copper loss of 1.6 kW. Determine: (i) The kVA load for maximum efficiency and value of maximum efficiency at unity power factor. (ii) The efficiency at half of full load and 0.8 power factor leading.	**07**
		OR	
	(b)	A 20-kVA, 440 / 220 V, 1-phase, 50-Hz transformer has iron loss of 324 W. The copper loss is found to be 110 W when delivering half full-load current. Determine: (i) Efficiency when delivering full-load current at 0.8 lagging power factor. (ii) The percent of full-load when the efficiency will be maximum.	**07**
Q.3	**(a)**	Explain the construction and principle of operation of Induction Motor.	**07**
	(b)	A 3-phase induction motor is wound for 4-pole and is supplied from 50-Hz system. Calculate: (i) The synchronous speed (ii) The rotor speed when slip is 3%. (iii) Rotor frequency when rotor runs at 500 rpm.	**07**
		OR	
Q.3	**(a)**	Explain the torque-slip and torque-speed characteristics of 3-phase induction motor and discuss the effect of rotor resistance on it.	**07**
	(b)	A 440-V, 3-phase, 50 Hz, 4 pole, Y connected induction motor has a full load speed of 1425 rpm. The rotor has an impedance of (0.4 + j4) Ω and rotor/stator turn ratio of 0.8. Calculate: (i) Full load torque (ii) Rotor current (iii) full load rotor Cu loss	**07**
Q.4	**(a)**	Explain the construction of an alternator in detail.	**07**
	(b)	Explain the necessity of DC motor Starter and discuss on three point starter with neat sketch.	**07**
		OR	
Q.4	**(a)**	Derive the equation for induced emf in an alternator.	**07**
	(b)	Explain the parallel operation of 3-phase alternator.	**07**
Q.5	**(a)**	Explain – Schrage motor.	**07**
	(b)	Explain- linear induction motor.	**07**
		OR	
Q.5	**(a)**	Write short note on: Stepper Motor.	**07**
	(b)	Explain the construction and torque speed characteristics of DC servo motor	**07**

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