Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV • EXAMINATION – WINTER 2013

Subject Code: 142401 **Date: 19-12-2013**

Subject Name: Electro Mechanical Energy Conversion - I

Time: 02:30 pm to 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 zero power factor method for determining the voltage regulation of a three-phase alternator.	**07**
	(b)	Explain the working principle of single-phase repulsion motor with necessary diagram.	**07**
Q.2	**(a)**	Explain the theory of production of rotating field in three-phase induction motor with three-phase supply.	**07**
	(b)	Explain the construction and working of permanent magnet stepper motor. List the advantages and disadvantages of permanent magnet stepper motor.	**07**
		OR	
	(b)	Define pitch factor and distribution factor. Derive the equation of the induced emf for three-phase alternator.	**07**
Q.3	**(a)**	Explain the characteristics of separately-excited dc generator.	**07**
	(b)	A shunt generator delivers 195 A at terminal voltage of 250 V. The armature resistance and shunt field resistances are 0.02 Ω and 50 Ω respectively. The iron and friction losses equal 950 W. Find (i) E.M.F. generated (ii) Cu losses (iii) output of the prime mover and (iv) mechanical and electrical efficiencies.	**07**
		OR	
Q.3	**(a)**	Explain the external and internal characteristics of dc shunt generator.	**07**
	(b)	A 200 V dc shunt motor takes 4 A at no-load when running at 700 rpm. The field resistance id 100 Ω. The resistance of armature at standstill gives a drop of 6 volts across armature terminals when 10 A were passed through it. Calculate (i) speed on load (ii) torque in N-m and (iii) efficiency. The normal input of the motor is 8 kW.	**07**
Q.4	**(a)**	Explain the iron losses of dc machine.	**06**
	(b)	Explain the flux control method and Ward-Leonard system of speed control of dc shunt motor.	**08**
		OR	
Q.4	**(a)**	Explain the voltage build-up of dc shunt generator. State the conditions for the build-up of dc generator.	**06**
	(b)	Discuss the necessity of starter. Explain the three-point starter with neat diagram.	**08**
Q.5	**(a)**	Write a technical note on "Auto Transformer".	**07**
	(b)	Obtain the equivalent circuit of a 200/400 V, 50 Hz, 1-phase transformer from the following test data. O.C. test : 200 V, 0.7 A, 70 W - on L.V. side S.C. test : 15 V, 10 A, 85 W - on H.V. side	**07**
		OR	
Q.5	**(a)**	Derive the equation for the torque of three-phase induction motor under running condition. Derive the condition for the maximum torque under running condition.	**07**
	(b)	A 150 kW, 300 V, 50 Hz, 6-pole star connected induction motor has a star connected slip-ring rotor with a transformation ratio of 3.6(stator/rotor). The rotor resistance is 0.1 Ω/phase and it's per phase leakage reactance is 3.61 mH. The stator impedance may be neglected. Find the starting current and starting torque on rated voltage with short-circuited slip rings.	**07**

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