Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. Sem-Vth Examination December 2010

Subject code: 152001

Subject Name: Electromechanical Energy conversions

Date: 13 / 12 / 2010 **Time: 03.00 pm - 05.30 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)**	List out the properties of a magnetic material.	**07**
	(b)	Explain AC operation of magnetic circuits	**07**
Q.2	**(a)**	For an attracted armature relay excited by an electric source, explain mechanical energy.	**07**
	(b)	Give the idea about general constructional features of Induction Machine.	**07**
		OR	
	(b)	i) A typical Magnetic circuit with air gap has dimensions: Ac = 4 X 4 cm^2, lg = 0.06 cm, lc = 40 cm, N = 600 turns. Assume the value of μr = 6000 for iron. Find the exciting current for Bc = 1.2 T and the corresponding flux and flux linkages.	**03**
		ii) For a loop place left side near long straight wire carrying current I with continuously increasing amount then explain how direction of induced current in the loop is found?	**04**
Q.3	**(a)**	For a linear magnetic circuit of N turns on iron core, derive the formula for magnetic field energy & energy density.	**07**
	(b)	A ring made up of ferromagnetic material is placed inside toroid having N turns per unit length then explain how hysteresis loop is obtained.	**07**
		OR	
Q.3	**(a)**	Give the proof of Gauss's Law.	**07**
	(b)	i) Explain equivalent circuit of an iron core reactor.	**05**
		ii) Derive the formula of self inductance for a long solenoid.	**02**
Q.4	**(a)**	Explain any two methods of starting single phase Induction motor	**07**
	(b)	Derive the expression for emf generated in practical DC Machines	**07**
		OR	
Q.4	**(a)**	i) Give the application of Gauss's Law of charged conductor.	**04**
		ii) Two particles A & B having charges 8 * 10^-6 C and -2 * 10^-6 C respectively are held fixed with a separation of 20 cm. Where a third charged particle should be placed so that it does not experience a net electric force?	**03**
	(b)	Explain rotating magnetic field in 3 Phase AC Machines.	**07**
Q.5	**(a)**	Explain reluctance motor.	**07**
	(b)	Explain hysteresis motor.	**07**
		OR	
Q.5	**(a)**	For an attracted armature relay excited by an electric source derive the equation giving relation between field energy and mechanical force.	**07**
	(b)	i) Explain rotating magnetic field in 2 Phase AC Machines.	**02**
		ii) Objectives:	**05**

A) If a positive charge is shifted from a low potential region to a high potential region, the electric potential energy.

a) Increases b) Decrease c) remains same

B) A point charge q is rotated along a circle in the electric field generated by another point Q. The work done by the electric field on the rotating charge in one complete revolution is,

a) Zero b) positive c) negative

C) A parallel plate capacitor has plates of unequal area. The larger plate is connected to the positive terminal of the battery and the smaller plate to its negative terminal. Let Q+ and Q- be the charges appearing on the positive and negative plates respectively.

a) Q+ > Q- b) Q+ < Q- c) Q+ = Q-

D) A parallel plate capacitor is connected to a battery. A Metal sheet of negligible thickness is placed between the plates The sheet remains parallel to the plates of the capacitor.

a)Capacitance will increase

b) The battery will supply more charges

c) Equal and opposite charges will appear on the two faces of the metal plate

E) The capacitance of the capacitor does not depend on

a) The charges on the plates

b) the shape of the plates

c) The separation between the plates.

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