

GUJARAT TECHNOLOGICAL UNIVERSITY
BE SEM-V Examination-Nov/Dec.-2011

Subject code: 152001

Date: 22/11/2011

Subject Name: Electro Mechanical Energy Conversion

Time: 2.30 pm -5.00 pm

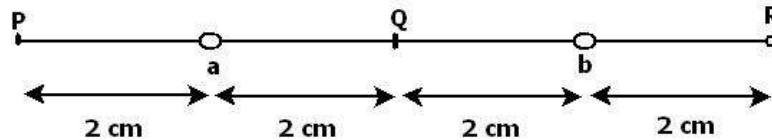
Total marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) 07

Two long wires 'a' and 'b', carrying equal currents of 15 A, are placed parallel to each other with a separation of 4 cm between them as shown in figure. Find the magnetic field B at each of the points P, Q and R.



(b) 07 Explain various types of magnetic materials and also explain various properties of magnetic materials.

Q.2 (a) 07 Derive the expression for power loss in ferromagnetic structure due to eddy current effects.

(b) 07 Derive the expression for magnetic field due to current in straight wire.

OR

(b) 07 Explain various methods for analyzing ferromagnetic circuits.

Q.3 (a) 07 Explain energy balance in non-linear magnetic systems excited by a single source with suitable graphs and expressions.

(b) 07 Derive the equation for the force density of attraction of the magnetic field on the armature and also find force density on an iron armature having magnetic flux density of 1.6 T at the iron surface.

OR

Q.3 (a) 07 Write a short note on plunger type electromagnet.

(b) 07 A plunger type magnet exerts a pull of 200Kg through 25mm air gape, the reluctance of the iron portions of the circuit being such that only 75 percent of total mmf of the coil is available to send the flux across the gape. Calculate the pull of the magnet when the gap is reduced to 12.5 mm and the total mmf is reduced by 10 percent, given that mmf to overcome the reluctance of iron portions of the magnetic circuit in the second instance is twice as great in the first instance.

- Q.4 (a)** Draw a schematic diagram of rotating magnetic system excited by a single source and derive expression for restoring torque exerted on the rotor by the magnetic field. **07**
- (b)** Derive expression for force on current carrying conductor placed in a magnetic field. **07**

OR

- Q.4 (a)** Derive the expression for emf generated in practical DC Machines **07**
- Q.4 (b)** Explain rotating magnetic field in 2-phase and 3-phase induction machine. **07**

- Q.5 (a)** Explain hysteresis motor. **07**
- (b)** Explain generalized machine and also give energy conversion in matrices equations. **07**

OR

- Q.5 (a)** Explain any two methods of starting single phase Induction motor. **07**
- (b)** Write a short note on doubly excited transducer as a rotating machine with a uniform air gap. **07**
