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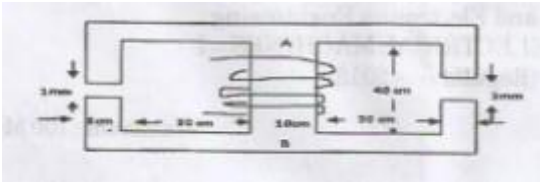
EE 8301 Electrical Machines - I

Important 13mark Questions

Unit I

1. Derive the expression for self-inductance and mutual inductance and also define coefficient of coupling.
2. Draw and explain the typical magnetic circuit with air-gap and its equivalent electric circuit. Hence derive the expression for air gap flux.
3. The core of an electromagnet is made of an iron rod of 1 cm diameter, bent in to a circle of mean diameter 10 cm, a radial air gap of 1 mm being left between the ends of the rod. Calculate the direct current needed in coil of 2000 turns uniformly spaced around the core to produce a magnetic flux of mwb in the air gap. Assume that the relative permeability of the iron is 150, that the magnetic leakage factor is 1.2 and that the air gap is parallel.
4. For the magnetic circuit, with a core thickness of 5 cm, exciting current of 0.5A wound with 1000 turns coil, find the flux density and flux in each of the outer limbs and the central limbs. Assume relative permeability for iron of the core to be (a) infinity (b) 4500.



Unit II

1. Explain the back to back method of testing for two identical single phase transformers.
2. Draw the equivalent circuit of a single phase 1100/220V transformer on which the following results were obtained.
3. Explain the principle of operation of a transformer. Derive its EMF equation.
4. Draw and explain the phasor diagram of transformer when it is operating under load.

Unit III

1. Discuss in detail the production of mechanical force for an attracted armature relay excited by an electric source.
2. Explain the concept of electromechanical energy conversion with neat diagram.
3. Explain in detailed MMF distribution in AC synchronous machine and derive the expression for fundamental MMF.
4. Derive the field energy, co-energy and force for a doubly excited system.

Unit IV

1. Explain in detail about commutation and list out the various methods of improving commutation in detail with a neat sketch.
2. Derive the relation for induced emf in the dc generator from the fundamental principle.
3. Explain the effect of armature reaction in a DC generator. How are its demagnetizing and cross magnetizing ampere turns calculated?
4. A 4 pole DC shunt generator, with a shunt field resistance of 100 ohms and an armature resistance of 1 ohm, has 378 wave connected conductors in its armature. The flux per pole is 0.02 Wb. If a load resistance of 10 Ω is connected across the

armature terminals and the generator is driven at 1000 rpm. Calculate power absorbed by the load.

Unit V

1. Explain the different methods of speed control techniques of DC motors.
2. Draw the neat sketch of 3-point starter and explain its working.
3. Explain the various characteristics of DC compound motor with necessary graphs.
4. With the help of neat circuit diagram, explain Swinburne's test and derive the relations for efficiency.