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Question Paper Code : X 10389

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Third Semester
Electrical and Electronics Engineering
EE 8301 – ELECTRICAL MACHINES – I
(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Write the relationship between reluctance and magneto motive force.
2. Why magnetic core of a transformer is producing noise in audible bandwidth ?
3. What are the uses of parallel operation of transformers ?
4. Mention the condition for obtaining maximum efficiency in transformers.
5. Energy for a system is obtained as (0.09/g)*(2/3)*$i^{3/2}$. Find the force. Variables 'g' and 'i' can be considered as distance and current.
6. What are the drawbacks of magnetic saturation ?
7. Compare Lap and wave winding.
8. Define critical resistance.
9. What are the applications of DC shunt and DC series motors ?
10. Why Swinburne's test cannot be conducted on DC series motor ?

PART – B **(5×13=65 Marks)**

11. a) The magnetic circuit of Figure 1 has cast steel core with dimensions as shown :

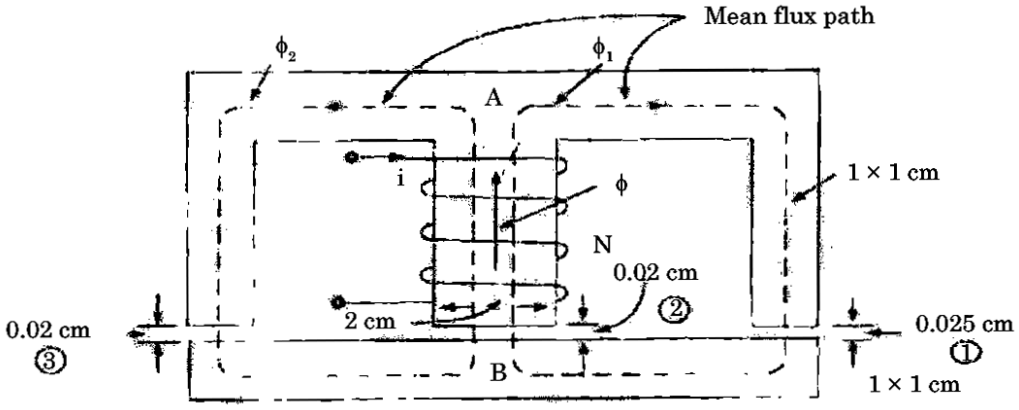

Figure 1. Magnetic circuit

Mean length from A to B through either outer limb = 0.5 m

Mean length from A to B through the central limb = 0.2 m

In the magnetic circuit shown it is required to establish a flux of 0.75 mWb in the air-gap of the central limb. Determine the mmf of the exciting coil if for the core material (a) μ_r = infinite (b) μ_r = 5000. Neglect fringing. **(6+7)**

(OR)

b) Derive the formulae to find the core loss of a machine.

12. a) Draw and explain the phasor diagram of a transformer under leading, lagging and unity power factor. Phasor diagram should indicate primary and secondary parameters.

(OR)

b) A single phase transformer working at unity power factor has an efficiency of 90% at both half load and at the full load of 500 W. Determine the efficiency at 75% full load and the maximum efficiency. **(7+6)**

13. a) Derive an expression for energy and co-energy of a doubly excited system. **(6+7)**

(OR)

b) Draw the mmf pattern of a distributed single phase winding in a three phase machine. Number of slots for a single phase winding can be considered as 6 and number of conductors per slot are two.

14. a) Explain the open circuit and load characteristics of shunt generator. **(6+7)**

(OR)

b) What is armature reaction ? Describe the effects of armature reaction on the operation of DC machines.

15. a) A 4 pole, 250 V, wave connected shunt motor gives 10 kW when running at 1000 rpm and drawing armature and field currents of 60 A and 1 A respectively. It has 560 conductors and armature resistance of 0.2 Ohms. Assuming a drop of 1 V per brush, determine total torque, useful torque, useful flux per pole, rotational losses and efficiency. **(3+3+3+2+2)**

(OR)

b) Explain the various methods of speed control for DC shunt motor.

PART – C **(1×15=15 Marks)**

16. a) A dc shunt generator delivers 50 kW at 250 V when running at 400 rpm. The armature and field resistance are 0.02 Ω and 50 Ω respectively. Calculate the speed of the machine when running as a shunt motor and taking 50 kW input at 250 V. Allow 1 V per brush for contact drop.

(OR)

b) Two 1ϕ furnaces working at 100 V are connected to a 3300 V, three phase supply through Scott connected transformers. Determine the currents in the three phase lines when the power taken by each furnace is 500 kW at a power factor of 0.8 lagging. Neglect transformer losses.

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