B.E. Electrical (Electronics & Power) Engineering (MODEL CURRICULUM) Sem-III

004 - SE104 : Electrical Machines-I

P. Pages : 2 **GUG/W/22/13855**

Time : Three Hours * 3 0 8 4 * Max. Marks : 80

Notes : 1. All questions carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.
5. Use of slide rule, Logarithmic tables, Steam tables, Mollier's chart, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts, Refrigeration charts and non-programmable calculator is permitted.

1. a) State and explain Ampere's law. **4**

b) Explain the B-H curve and various properties of magnetic materials. **8**

c) What is magnetic field and magnetic lines of force? State the properties of line of force. **4**

OR

2. a) Point out the analogy between electric and magnetic circuits. **6**

b) A toroidal core mode of mild steel has a mean diameter of $16\,cm^2$ and a cross – sectional area of 3 cm calculate **8**

1. the m.m.f. of produce a flux of 4×10^{-4} Wb and
2. the corresponding values of the reluctance of the core and the relative permeability.

c) Define magneto motive force and state its units. **2**

3. a) Write a note on energy balance equation. **4**

b) Derive the expression for energy stored in the magnetic field. **4**

c) Explain the concept of electromechanical energy conversion with neat diagram. **8**

OR

4. a) Represent pictorially the flow of energy in electromechanical devices for both generating and motoring action. **8**

b) State the types of magnetic system along with two examples of each. **8**

5. a) Explain with a neat sketch, the construction of a d.c. machine. **8**

b) Draw and explain internal and external characteristics of dc series generator. **8**

OR

6. a) Distinguish between lap and wave windings. **6**

b) Define the following terminology of armature winding o a d.c. machine: **4**

i) Conductor ii) Turn

iii) Coil and coil side iv) Coil span

c) A 4 pole, lap wound, d.c. generators has 42 coils with 8 turns per coil, it is driven at 1120 r.p.m. If useful flux per pole is 21 mWb, calculate the generated e.m.f. find the speed at which it is to be driven to generate the same e.m.f. as calculated above, with wave wound armature. **6**

7. a) Explain voltage build up process of D.C. Generator. Also derive E.M.F. equation of D.C. Generator. **6**

b) Derive the emf equation of generator. **5**

c) Derive the equation of armature torque in d.c. motor. Hence justify **5**

$T_a \alpha I_a^2$ in series motor &

$T_a \alpha I_a$ in shunt motor

Where T_a is armature torque & I_a is the armature current.

OR

8. a) Give classification of DC generators with neat connection diagram. **8**

b) State advantages and disadvantages of Swinburne's test. **4**

c) Define armature reaction. Explain cross magnetizing and demagnetizing effects of armature reaction in brief. **4**

9. a) Draw a phasor diagram to represent conditions in a single phase transformer supplying load at **6**

1) Unity p.f. 2) Lagging p.f. and

3) Leading p.f.

b) Explain working principle of single phase transformer. **4**

c) Discuss the difference between core type and shell type construction. **6**

OR

10. a) Explain various losses in transformer and how to minimize them? On what factors they depend? Give the equations for these losses. **6**

b) Explain polarity test of single phase transformer. **6**

c) State the advantages of Autotransformer. **4**

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