



- 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 and Refrigeration charts is permitted.
  6. Use of Non-programmable calculator is permitted.

1. a) Explain the B-H curve and various properties of magnetic materials. **8**
- b) A toroidal core made of mild steel has a mean diameter of  $16\text{cm}^2$  and a cross-sectional area of  $3\text{cm}^2$  calculate. **8**
1. The m.m.f of produce a flux of  $4 \times 10^{-4}$  Wb and
  2. The corresponding values of the reluctance of the core and the relative permeability.

**OR**

2. a) Point out the analogy between electric and magnetic circuits. **6**
- b) What is magnetic field and magnetic lines of force? State the properties of line of force. **4**
- c) Define permeability of a magnetic material and the factors on which it depends. **3**
- d) Define magneto motive force and state its units. **3**
3. a) Derive the expression for energy stored in the magnetic field. **8**
- b) Explain the concept of electromechanical energy conversion with neat diagram. **8**

**OR**

4. a) Draw and explain the general block diagram of an electromechanical energy conversion device. **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) 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  $21\text{mWb}$ , 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. **8**

**OR**

6. a) Distinguish between lap and wave windings. 6
- b) Define the following terminology of armature winding of a d.c. machine: 4
- i) Conductor ii) Turn
- iii) Coil and coil side iv) Coil Span
- c) Explain the various effects of armature reaction. 6
7. a) Derive the emf equation of generator. 5
- b) Derive the equation of armature torque in d.c. motor. hence Justify 5
- $T_a \propto I_a^2$  in series motor &
- $T_a \propto I_a$  in shunt motor.
- Where  $T_a$  is armature torque &  $I_a$  is the armature current.
- c) Explain voltage build up process of D.C. Generator. Also derive E.M.F. equation of D.C. Generator. 6

**OR**

8. a) Give classification of DC generators with neat connection diagram. 8
- b) Explain the Hopkinson's test for determining efficiency of two similar d.c. shunt machines. 8
9. a) Explain working Principle of single phase transformer. 4
- b) Discuss the difference between core type and shell type construction. 6
- c) Derive E.M.F. equation of Transformer. 6

**OR**

10. a) Explain the working of practical transformer on load. 4
- b) Explain in detail step by step the procedure to draw the equivalent circuit of transformer. 8
- c) State the advantages of Autotransformer. 4

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