B.E. / B.Tech. Electrical (Electronics & Power) Engineering (Model Curriculum) Semester-III

SE104 / 004 : Electrical Machines-I

P. Pages : 2 **GUG/S/25/13855**

Time : Three Hours * 2 2 9 0 * 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 and Refrigeration charts is permitted.
6. Use of non programmable calculator is allowed.

1. a) Write short notes on: magnetic flux, magnetic flux Density, mmf, magnetic field strength. **8**

b) A toroidal core made of mild steel has a mean diameter of 16 cm^2 and a cross-sectional area of $3cm^2$ 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.

Consider a magnetic field strength for mild steel H = 950 A turns/m.

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) A coil of 200 turns is wound uniformly on wooden ring having a mean circumference of 600mm and a uniform cross sectional area of 500 mm^2 If the current through the coil is 4A. Calculate the magnetic field strength, flux density, the total flux. **3**

3. a) Explain the B-H curve and various properties of magnetic materials. **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 different types of d.c. motors with voltage- current equations. **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 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)	Explain the significance of Back e.m.f.	**4**
	c)	Explain the various effect 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 $T_a \propto I_a^2$ in series motor & $T_a \propto I_a$ in shunt motor. Where T_a is armature torque & I_a is the armature current.	**5**
	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 in Detail the various methods of speed control in d.c. series motor.	**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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