

B.E. / B.Tech. Electrical (Electronics & Power) Engineering (Model Curriculum) Semester-III
SE104(PCC) / 004: Electrical Machines-I

P. Pages : 2

Time : Three Hours



GUG/W/24/13855

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. Read the question paper carefully (Branch, Semester, Scheme) before attempting the questions.
 7. Every question has equal weightage.
 8. Use of programmable calculator is prohibited.
 9. Draw neat and proper diagram / sketches.
 10. Don't use red pen for writing the answers.
 11. Don't write any other comments except answers of questions.

1. a) A toroidal core made of mild steel has a mean diameter of 20 cm^2 and a cross-sectional area of 4 cm^2 calculate. 8
1. The m.m.f of produce a flux of $4 \times 10^{-4} \text{ Wb}$ and
 2. The corresponding values of the reluctance of the core and the relative permeability.
- b) Explain the B-H curve and various properties of magnetic materials. 8

OR

2. a) Is straight conductor of 50 cm long has a current of 300 ampere flowing through it. Calculate H and B for the straight conductor. In the same wire is bent into a square and then into a circle, find magnetizing force at the center of the square and the center of the circle. 8
- b) A wire of 6 m long is bent. 8
- i) into a square
 - ii) into a circle
- If the current flowing through the wire is 200 A , find magnetizing force and the flux density at the center of square and center of circle.
3. a) Explain the concept of electromechanical energy conversion with neat diag. 8
- b) Consider a solenoid having a area of 0.95 m^2 , 30 no. of turns having a magnetic field intensity of 24 AT/m . The inductance in the conductor is 15 henry . Calculate the energy stored in the magnetic field of the solenoid. 8

OR

4. a) Derive the expression for energy stored in the magnetic field. 8
- b) Represent pictorially the flow of energy in electromechanical devices for both generating and motoring actions. 8
5. a) 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 21mWb, 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
- b) Draw and explain internal and external characteristics of dc series generator. 8

OR

6. a) A 4 pole DC generator with wave wound armature has 51 slots each having 24 conductors. The flux per pole is 10 mwb. At what speed must the armature rotate to give an induced EMF of 0.24 kv. 8
- b) Draw and explain the construction of DC machine. 8
7. a) A 120 volt DC shunt motor draws a current of 200 ohm ampere. The armature resistance is 0.02 and shunt field resistance of 30 ohm find. 8
- i) back EMF
- ii) If the lap wound armature has 90 slots with 4 conductors per slot, at what speed will the motor Run when the flux per pole is 0.04 wb?
- b) Explain the different types of losses in DC machine. 8

OR

8. a) Explain the Hopkinson's test for determining efficiency of two similar d.c. shunt machines. 8
- b) A long shunt compound wound DC motor draws 200 ampere at 220 volt. If the resistance of the shunt field winding, series and armature winding are 25 Ohm, 0.06 Ohm and 0.08 Ohm. Find the back emf? 8
9. a) Draw and explain the equivalent circuit diagram of transformer. 8
- b) Write about the short circuit and short circuit test on transformer with its significance. 8

OR

10. a) Explain Constructional details and its operation. State the advantages of Autotransformer. 8
- b) Discuss the difference between core type and shell type construction. 8
