

B.E. Electrical (Electronics & Power) Engineering (Model Curriculum) Semester-III  
**104 / 004 - Electrical Machines-I**

P. Pages : 2

Time : Three Hours



**GUG/W/23/13855**

Max. Marks : 80

- Notes :
1. All questions are compulsory.
  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) Define : 8  
i) MMF ii) Reluctance  
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 centre of square and centre of circle.

**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 centre of the square and the centre of the circle. 8  
b) Explain Ampere's Circuital Law. 8  
3. a) Consider a solenoid having a area of  $0.95 \text{ m}^2$ , 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  
b) Derive the expression for force as a partial derivative of energy stored with respect to position of the moving object. 8

**OR**

4. a) Consider a solenoid having a area of  $0.85 \text{ m}^2$ , 25 no. of turns, having a magnetic field intensity of 21 AT/m. the inductance in the conductor is 15 henry. Calculate the energy stored in the magnetic field of the solenoid. 8

- b) Derive the expression for energy stored in the magnetic field. **8**
5. a) A 6 pole DC generator whose winding is wave wound. The total number of slot in the given DC generator is 60 with each slot consisting of 25 conductor. The flux per pole is 0.05 wb. Find **8**
- i) The speed of the armature when the induced EMF is 400 volt.
- ii) What will be the EMF induced if the winding is lap connected and the armature is rotating at the same speed.
- b) Derive the emf equation of DC 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 types of DC generator. **8**

**OR**

8. a) 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**
- b) Explain the different types of losses in DC machine. **8**
9. a) Explain the construction and working of transformer? **8**
- b) Draw and explain the equivalent circuit diagram of transformer. **8**

**OR**

10. a) Write about the short circuit test on transformer. **8**
- b) Write about the open circuit test on transformer. **8**

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