Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 71632

M.E. DEGREE EXAMINATION, JUNE/JULY 2013.

First Semester

Power Electronics and Drives

PE 9214/HV 9311/HV 911/PE 914 — ELECTROMAGNETIC FIELD COMPUTATION AND MODELING

(Common to M.E. Electrical Drives and Embedded Control and M.E. High Voltage Engineering)

(Regulation 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write the principle of energy conversion.

2. Write the expression for Poisson's and Laplace equations.

3. What is direct integration method?

4. What are the limitations of the conventional design procedure?

5. What do you mean by discretisation?

6. What is energy minimization?

7. Write the relationship between magnetic flux density and field intensity.

8. Define permeability.

9. Write the EMF equation of a transformer.

10. State faraday's law of electromagnetic induction.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Write Maxwell's equations in integral form and explain the significance of them. (6)

(ii) Derive the input electrical energy and stored magnetic field in an Electromagnetic device. (10)

Or

(b) A solenoid 25 cm long and 1 cm mean diameter of the coil turns has a uniformly distributed windings of 2000 turns. If the solenoid is placed in a uniform field of 2 Tesla flux – density and a current of 5A is passed through the solenoid winding, what is the maximum

(i) Force on the solenoid, (6)

(ii) Torque on the solenoid? (5)

(iii) What is the magnetic moment of the solenoid? (5)

12. (a) Distinguish between direct integration and variable separate method of solution of field equations.

Or

(b) Write short notes on :

(i) Field analysis based design (8)

(ii) Numerical method of solution. (8)

13. (a) (i) Briefly explain the concept of axis symmetric formulation with an example. (8)

(ii) Prove that the sum of shape function is equal to unity for of triangular element. (8)

Or

(b) Write short notes on :

(i) Variational method (8)

(ii) Differential/integral functions. (8)

14. (a) (i) Determine the capacitances of a parallel plate capacitor composed of tin-foil sheets, 25 cm square for plates separated through a glass – dielectric 0.5 cm thick with relative permittivity 6. (10)

(ii) Show that the energy stored in a capacitor is proportional to its capacitance and square of the voltage across it. (6)

Or

(b) (i) Derive the formula for inductance of a coil with iron core. (4)

(ii) A toroidal coil if 1000 turns has a mean radius of 20 cm and a radius for the winding of 2 cm. What is average self inductance

(1) with air core? (6)

(2) with an iron core of relative permeability of 800? (6)

15. (a) Discuss in details the design of cylindrical magnetic actuators.

Or

(b) Explain about the design of rotating machines.
