

**FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE
EXAMINATION, DECEMBER 2006**

EE 04 502—ELECTROMAGNETIC FIELD THEORY

(2004 admissions)

Time : Three Hours

Maximum : 100 Marks

Answer all questions.

1. (a) Given $\vec{A} = x^2 \vec{a}_x + xy \vec{a}_y + yz \vec{a}_z$, verify the divergence theorem over a cube one unit on each side. The cube is situated in the first octant of the Cartesian co-ordinate system with one corner at the origin.
- (b) Define electric dipole moment.
- (c) What is meant by vector potential ? Give the expression.
- (d) Find the magnetic flux density at the center of a square loop, with side a carrying a direct current I .
- (e) Give Maxwell's equations in differential form.
- (f) Give example for harmonically varying field.
- (g) Define SWR and group velocity.
- (h) Write the applications of stub matching.

(8 × 5 = 40 marks)

2. (a) (i) Derive the expression for the capacitance of isolated sphere. (7 marks)
- (ii) Derive the expression for the capacitance between a co-axial cylinder. (8 marks)

Or

- (b) (i) Discuss the method of images. (7 marks)
- (ii) Explain electrostatic boundary conditions. (8 marks)
3. (a) Determine the force between two coaxial circular coils of radii b_1 and b_2 separated by a distance d that is much larger than the radii ($d \gg b_1, b_2$). The coils consists of N_1 and N_2 closely wound turns and carry currents I_1 and I_2 respectively.

(15 marks)

Or

- (b) (i) State the Biot-Savart's law and give its applications. (8 marks)
- (ii) Write notes on Magnetization. (7 marks)
4. (a) Discuss the wave equations in a conducting medium. (15 marks)

Or

- (b) State and prove Poynting theorem. (15 marks)

Turn over

5. (a) (i) Write the concept of impedance matching.

(8 marks)

(ii) Write the concept of Brewster's angle.

(7 marks)

Or

(b) (i) Discuss the wave equations on a transmission line.

(10 marks)

(ii) Give the laws of reflection and refraction.

(5 marks)

[4 × 15 = 60 marks]