Roll No. ☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(EE)/(Electrical & Electronics)/
(Electronics & Electrical) (2011 Onwards)
(Sem.–4)
ELECTROMAGNETIC FIELDS
Subject Code : BTEE-403
Paper ID : [A1206]

Time : 3 Hrs.   Max. Marks : 60

INSTRUCTION TO CANDIDATES :
1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students has to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.**

SECTION-A

Q1. Write briefly :

a) Find a vector normal to a plane consisting of points pl(0,l,0), p2(l,0,l) and p3(0,0,l).

b) State Stokes theorem.

c) State and explain the relationship between potential gradient and electric field.

d) What are the sources of electric field and magnetic field?

e) Explain a few applications of Gauss law in electrostatics.

f) State and explain Biot -Savarts law.

g) What is a dipole? Calculate the dipole moment of a dipole with charges 2C and -2C separated by a distance of 2cm.

h) What is capacitance? Calculate the capacitance of a air filled capacitor having two parallel plates of area $2m^2$ separated by a distance of $0.2m$.

i) Calculate the emf of a material having a flux linkage of $2t^2$ at time $t = 1$ second.

j) What is phase constant? Calculate the velocity of wave propagation in a conductor with frequency 5×10^8 rad/s and phase constant of 3×10^8 units.

SECTION-B

Q2. Derive an expression for the electric field due to a straight and infinite uniformly charged wire of length 'L' meters and with a charge density of $+\lambda$ c/m at a point P which lies along the perpendicular bisector of wire.

Q3. What do you understand by Gradient and Curl? Find the gradient of the function given by $x^2+y^2+z^2$ at (1, 1, 1). Find the curl of the gradient vector as obtained for the above function.

Q4. A uniform plane electromagnetic wave with field varying sinusoidally with time, in medium 'A' is incident normally on the surface of medium 'B' Derive the expression for the reflection and refraction coefficients.

Q5. What is magnetic field intensity? The positive y axis (semi-infinite line *w.r.t.* the origin) carries a filamentary current of 2 A in the - direction. Assume it is a part of a large circuit. Find magnetic field intensity at (2, 3, 0).

Q6. What is the significance of the Maxwell's equations? State the Maxwell's equations in integral form for static and time varying fields.

SECTION-C

Q7. State and explain Ampere's law and modified Ampere's law. A solid cylindrical conductor of radius R has a uniform current density. Derive expression for H for both inside and outside of the conductor. Plot the approximate variation of H as a function of radial distance from the centre of wire.

Q8. Explain Poynting Vector. A plane electromagnetic wave having a frequency of 10 MHz has an average Poynting vector of 1 W/m^2. If the medium is lossless with relative permeability of 2 and relative permittivity of 3 Find :

a) The velocity of propagation,

b) The wavelength,

c) The impedance of the medium,

d) The rms value of the electric field E.

Q9. Write a short note on the following :

a) Green's theorem

b) Continuity equation

c) Analogies between electric and magnetic fields

d) Polarization.