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

Total No. of Questions : 09

B.Tech.(EE/Electrical & Electronics/Electronics & Electrical)

(Sem.–4)

ELECTROMAGNETIC FIELDS

Subject Code : BTEE-403 M.Code : 57106

Date of Examination : 07-07-22

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

1. Write briefly :

a. A parallel polarized wave travels from air into the dielectric medium at Brewster angle of 75°. Find the relative permittivity of the dielectric.

b. State 'Divergence Theorem'.

c. What is Lorentz force? Explain.

d. Predict the nature of the vector field.$A = 2yz\hat{a}_x+3zx\hat{a}_y+4xy\hat{a}_z$

e. Does A×B = A×C implies that B=C? Justify your answer.

f. If E is zero at any point, does it result into zero electric potential at that point?

g. A current density is distributed in the direction and is given by

$J = (r^2 + 2r)\hat{a}_z$; for r□ a.

Find magnetic field intensity at any point

h. What is the phase relation between a displacement current and a conduction current? Justify your answer.

i. Why mobile phone does not work properly in the basement of the building?

j. What is Surface Impedance?

SECTION-B

2. Derive the expressions of attenuation constant and phase constant from the expression of propagation constant for the uniform plane wave propagating through the lossy dielectric.

3. Use Ampere's circuital law to obtain magnetic field due to a wire of infinite length and carrying current I at a point distant r from the wire.

4. State and prove 'Gauss's law'. Discuss any two applications of Gauss's law.

5. State and prove that Maxwell's equation in differential and integral forms which introduces the concept of displacement current

6. Two homogeneous isotropic dielectrics meet at plane x=0. For x □ 0, □$_{r1}$ = 5 and for x □ 0, □$_r$[1] = 4. The electric field $E_1 = 2\hat{a}_x + 3\hat{a}_y + \hat{a}_z$V/m for x □ 0 exists. Find electric field for x □ 0, and electric flux density for both x □ 0 and x □ 0.

SECTION-C

7. a) Let the vector field $G = xy\hat{a}_x - (2y + x)\hat{a}_y + 10z\hat{a}_z$. Evaluate line integral □$_L G.\ dL$ from an initial point A(0,0,0) to B(l,2,3) using path -

   i) a straight line and

   ii) using straight line segments (0,0,0) to (1,0,0) to (1,2,0) to (1,2,3).

   b) Obtain the expression of capacitance of spherical capacitor using Laplace's equation.

8. a) The dielectric constant of water is 75. Find

   i) The Brewester angle for parallel polarization, and the corresponding angle of transmission.

   ii) The reflection and transmission coefficients when a plane wave with perpendicular polarization is incident from air on water surface at incidence angle equal to Brewster angle.

   b) A uniform plane wave of frequency 16GHz is traveling in a medium with conductivity as 18 S/m, □$_r$ = 50 and □$_r$ = 1. Obtain the loss tangent and predict thenature of the medium. Also, calculate the different characteristics associated withthe wave.

9. Write short notes on the following:

a) Magnetic Scalar Potential

b) Green's Theorem

c) Cartesian Coordinate System

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.