Total No. of Questions : 8]

SEAT No. :

P3598

[Total No. of Pages : 2

[5560]-553

T.E. (Electronics & Telecommunications)

ELECTROMAGNETICS

(2015 Pattern) (Semester - I) (304183)

Time : 2.30 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2; Q3 or Q4; Q5 or Q6; Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of smith chart and calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) A point charge of 30 nC is located at the origin, while plane y = 3 carries charge 10nC/m^2. Find $\bar{D}$ at (0, 4, 3). **[7]**

b) Derive an expression for capacitance of parallel plate capacitor. **[6]**

c) Define Biot-Savart's law. Derive the expression for magnetic field intensity due to straight infinite current filament. **[7]**

OR

Q2) a) Derive the expression of electric field intensity due to infinite sheet of charge with density ρ_s C/m^2. **[7]**

b) A 15nC point charge is at the origin in free space. Calculate V_1 at point P_1 (–2, 3, –1) if : (a) V = 0 at (6, 5, 4); (b) V = 0 at infinity. **[6]**

c) Derive the boundary condition that exist between the two different magnetics materials. **[7]**

Q3) a) What do you mean by displacement current. Prove that displacement current density is given by $\bar{J}_d = \frac{\partial \bar{D}}{\partial t}$. **[8]**

b) State Faradays Law. A circular loop lies in z = 0 plane has radius of 0.2m & resistance of 10 ohm. Find the current flowing through the conductor due to field $\bar{B} = 0.2 \sin 10^3 t \, \hat{a}_z$. **[8]**

OR

Q4) a) State and explain Maxwell's equation for time varying field in integral and point form. **[8]**

b) State and prove Poynting Theorem. State significance of Poynting vector. **[8]**

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Q5) a) Derive the expression for characteristics impedance and propagation constant in term of primary constant of transmission line. **[8]**

b) A distortionless line has z_0 = 60 Ω, α = 20 mNp/m, velocity of propagation = 0.6c, where C is the speed of light in a vaccum. Find R, L, G, C and λ at 100 MHz. **[10]**

OR

Q6) a) Discuss the reflection of wave on shorted, open circuited and matched transmission line. **[8]**

b) A lossless transmission line with $z_0 = 75\Omega$ is 30m long and operates at 2MHz. The line is terminated with a load $Z_L = 90 + j60\ \Omega$. If u = 0.6c on the line, using Smith chart find **[10]**

i) Reflection coefficient
ii) Standing wave ratio
iii) Input impedance
iv) Load admittance

Q7) a) What do you mean by uniform plane wave. Using Maxwell's equations in phasor notation, derive the expression for Helmholtz's equation in free space. **[8]**

b) A plane wave in a nonmagnetic medium has $\bar{E} = 50\sin\left(10^8 + 2z\right)\hat{a}_y$ V/m. Find **[8]**

i) Direction of wave propagation
ii) Wavelength, frequency
iii) Magnetic field H

OR

Q8) a) For uniform plane wave, explain the terms: **[8]**

i) Depth of penetration.
ii) Polarization.

b) Given the intrinsic impedances : $\eta_1 = 100\Omega$ and $\eta_2 = 300\Omega$, the normal incident electric field E_i = 100 mV/m, calculate : **[8]**

i) Reflection and transmission coefficient.
ii) Reflected and transmitted electric field $\bar{E}$
iii) Reflected and transmitted magnetic field $\bar{H}$

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