Total No. of Questions : 10]

SEAT No. :

P1724

[Total No. of Pages : 3

[5460] - 553
T.E. (E & Tc)
ELECTROMAGNETICS
(2015 Pattern)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data; if necessary.***
5) ***Use of Non - programmable calculator and Smith Chart is allowed.***

Q1) a) State and prove Gauss Theorem. **[5]**

b) A 5nc point charge is located at A (2, –1, 3) in free space. Find Electric Field Intensity at origin. **[5]**

OR

Q2) a) State the relation between Electrostatic potential & Electric field intensity. **[5]**

b) If $D = 5x / 2\ \hat{a}x\ c/m$ Evaluate both sides of divergence theorem for volume of cube 1m to an edge centered at origin & edges parallel to the axis. **[5]**

Q3) a) Derive the boundary condition at an interface between conductor and free space. **[6]**

b) State and prove Biot Savarts law. **[4]**

OR

Q4) a) An infinite long straight filament carrying current 3 A is placed along z - axis. Calculate magnetic field intensity at p(1, 2, 1) **[5]**

b) State and explain stockes theorem. **[5]**

P.T.O.

Q5) a) Write Maxwell's equations in point & integral form for time varying field & free space. **[8]**

b) Define conduction current & conduction current density? Derive current continuity equation. **[10]**

OR

Q6) a) State and prove Poynting theorem. **[8]**

b) The Electric field intensity $\bar{E}=250\sin 10t$ v/m for afield propagating in a medium whose $\sigma = 5.0$ s/m & $\in_r = 1.0$ Calculate Jd, Jc and frequency at which Jc = Jd. **[10]**

Q7) a) Explain various primary and secondary parameters of Transmission line. **[6]**

b) A transmission line has following primary constants : **[10]**
R = 11 Ω/Km, G = 0.8 mho/Km, L = 0.00367 H/Km, C = 8.35 nf/Km. At a single of 1 KHz.

Calculate :

i) Characteristic impedance

ii) Attenuation constant

iii) Phase constant

iv) Wavelength

v) Velocity

OR

Q8) a) What is distortion less line? Derive the expression for characteristic impendence and propagation constant for distortion less line. **[6]**

b) A lossless 100 Ω transmission line is terminated in an impedance 50 + j60 Ω **[10]**

Calculate

i) VSWR

ii) Reflection coefficient.

iii) Impedance of 0.35 Ω from load using smith chart.

Q9) a) Derive from Maxwell's equations the wave equation in vector form for Electric Field Intensity in free space. **[8]**

b) Find skin depth at frequency of 1.6 MHz in aluminum whose $\sigma = 38.2 \times 10^{-3}$ s/m & new $\mu_r = 1.0$. Also find propagation constant and wave velocity propagating in that medium ($\alpha = \beta = 1/\delta$) **[8]**

OR

Q10) a) Define depth of penetration. Derive expression for depth of penetration for a good conductor. **[8]**

b) A 10 GHz plane wave travelling in free space as an amplitude Ex = 10 V/m. Find V, λ, β, η and amplitude & direction of H. **[8]**

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