Total No. of Questions : 8]

SEAT No. :

**P1730**

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# T.E. (Electronics & Telecommunication)
# ELECTROMAGNETICS AND TRANSMISSION LINES
# (2012 Course) (Semester-I)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.***
2) ***Figure to right indicate full marks.***
3) ***Neat diagram must be drawn wherever required.***
4) ***Use electronic pocket calculator and smith chart is allowed.***
5) ***Assume suitable data, if necessary.***

***Q1)*** a) Derive expression for flux density for an infinite line charge using Gauss law. **[6]**

b) Derive relation between $\bar{E}$ and V. Also state significance of potential gradient. **[8]**

c) State & explain stokes theorem. **[6]**

OR

***Q2)*** a) A point charge of 2nC is located at (4, –1, –3) & a uniform line charge of –25nC/m lies along the intersection of planes X = –4 & Z = 6 calculate $\bar{D}$ and $\bar{E}$ at (3, 1, 0). **[8]**

b) Derive boundary condition for perfect dielectric media. **[8]**

c) In the region $0 < r < 0.5$m in cylindrical coordinates, the current density is $\bar{J} = 4.5e^{-2r}\, a_z \left(\frac{A}{m^2}\right)$ and J = 0 elsewere. Use Ampere's law to find $\bar{H}$. **[4]**

***P.T.O.***

***Q3)*** a) What is pointing vector? What is its significance? Derive the expression for average pointing vector. **[8]**

b) In free space $\bar{E} = 20\cos(wt - 50x)\ \overline{ay}$ V/m determine: **[8]**

i) $I_d$ ii) H

iii) W

OR

***Q4)*** a) Write Maxwell's equation on the basis of Ampere's circuit law in integral as well as differential form and modify the above equation for sinusoidal time varying field in free space. **[8]**

b) A boundary condition exists at Z = 0 between two dielectrics $\in_{r1} = 2.5$ region $Z < 0$ & $\in_{r2} = 4$ in the region $Z > 0$. The field in the region of $\in_{r1}$ is $\bar{E} = = -30\overline{ax} + 50\overline{ay} + 70\overline{az}\ \frac{V}{m}$ **[8]**

Find:

i) Normal component of $E_1$.

ii) Tangential component of $E_1$.

iii) Angle $\alpha_1$ between $E_1$ & normal to surface.

iv) Normal component of $D_2$.

v) Tangential component of $D_2$.

vi) Angle $\alpha_2$ between $D_2$ & normal to surface.

***Q5)*** a) Define various parameters of transmission line. **[6]**

b) What are the different types of distortion? Derive the condition for Inductance loading on Telephone cable. **[10]**

OR

***Q6)*** a) Derive the equation for voltage & current of general solution of transmission line. **[10]**

b) Prove that $Z_0 = \sqrt{Z_{oc} Z_{sc}}$ . **[6]**

***Q7)*** a) Derive expression for characteristic impedance, propagation constant and velocity of propagation for distortion less line. **[8]**

b) A transmission line with characteristics impedance of $692\angle -12^{\circ}\Omega$ is terminated in 200Ω resistor. Determine reflection coefficient & SWR. **[10]**

OR

***Q8)*** a) What do you mean by single stub matching on a line and derive the equation of single stub along the line. **[8]**

b) In lossless 100Ω transmission line is terminated in an impedance 50 + j60 Ω. Calculate VSWR, reflection coefficient, impedance of 0.35λ from the load using smith chart. **[10]**

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