Total	No.	\mathbf{of}	Questions	:	8]
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SEAT No.:	
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[Total No. of Pages: 3

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.
 - b) Derive relation between \overline{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 \overline{D} and \overline{E} at (3, 1, 0).
 - b) Derive boundary condition for perfect dielectric media. [8]
 - In the region 0 < r < 0.5m in cylindrical coordinates, the current density is $\overline{J} = 4.5e^{-2r} \ a_z \left(\frac{A}{m^2}\right)$ and J = 0 elsewere. Use Ampere's law to find \overline{H} .

Q3) a)	What is pointing vector? What is its significance? Derive the for average pointing vector.	expression [8]
b)	In free space $\overline{E} = 20 \cos(wt - 50x) \overline{ay}$ 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 $\epsilon_{r1} = 2.5$ region Z < 0 & $\epsilon_{r2} = 4$ in the region Z > 0. The field in the region of ϵ_{r1}

is
$$\overline{E} = -30\overline{ax} + 50\overline{ay} + 70\overline{az}\frac{V}{m}$$
 [8]

Find:

- i) Normal component of E₁.
- ii) Tangential component of E₁.
- iii) Angle α_1 between E_1 & normal to surface.
- iv) Normal component of D₂.
- v) Tangential component of D_2 .
- vi) Angle α_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.

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 $50 + j60 \Omega$. Calculate VSWR, reflection coefficient, impedance of 0.35λ from the load using smith chart. [10]

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