Total No. of Questions :8]

SEAT No. :

P2578

[Total No. of Pages :3

[5153] - 554

T.E. (Electronics & Telecommunication)

ELECTROMAGNETICS & 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 the expression for electric field intensity $\bar{E}$ at a point 'P' due to infinite line charge with uniform line charge density 'ρ_L'. **[6]**

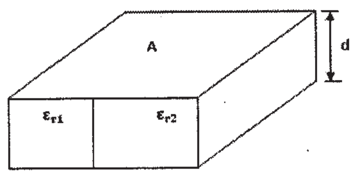
b) Derive the electrostatic boundary condition between two dielectric media. **[8]**

c) Find $\bar{H}$ at point P(2, 3, 4) caused by a current filament of 12A in $\widehat{a_y}$ direction on y axis and extending from y=0 to y=8. **[6]**

OR

Q2) a) Derive relation between $\bar{E}$ and V. Also state significance of potential gradient. **[8]**

b) Find the capacitance of parallel plate capacitor containing two dielectrics, ε_{r1} = 1.5 and ε_{r2} = 3.5, each comprising one half the volumes as shown in figure. Here area of plates A = 2m^2 and d = 10^{-3} m. **[6]**



c) State and prove Ampere's Law and apply the same for infinite sheet of current. **[6]**

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Q3) a) Write Maxwell's equations for static and time varying fields in point and integral forms. **[8]**

b) State and prove Poynting theorem. Interpret each term. **[8]**

OR

Q4) a) What do you mean by uniform plane wave? Obtain equation of wave travelling in free space in terms of $\bar{E}$. **[8]**

b) The magnetic field of an EM wave in free space is given by

$\vec{H} = 0.5 \in_0 \cos(\omega t - 100z)\hat{a}_y \frac{A}{m}$. Find the electric field intensity and displacement current density. **[8]**

Q5) a) State primary and secondary constants of transmission lines. Derive the relationship between primary and secondary constants of transmission line. **[8]**

b) The characteristic impedance of the uniform transmission line is 2040 Ω at a frequency of 800 Hz. At this frequency, the propagation constant is $0.054\angle 87.9^{o}$. Determine R, L. G, C, α and β. **[8]**

OR

Q6) a) Explain the phenomenon of reflection of transmission line and hence define reflection coefficient. **[8]**

b) Derive the expression for characteristic impedance (Z_0) and propagation constant in terms of primary constants of transmission lines. **[8]**

Q7) a) What is impedance matching? Explain necessity of it. What is stub matching? Explain single stub matching with merits and demerits. **[10]**

b) A 50 Ω line is terminated by a load impedance of (75 – j 69) Ω. The line is 3.5 meter long and is excited by 50 MHz source. Propagation velocity is 3×10^8 m/sec. Find the input impedance, reflection coefficient, VSWR, position of minimum voltage. **[8]**

OR

Q8) a) What is mean by distortionless line? Derive the expression for characteristic impedance and propagation constant for it. **[10]**

b) A transmission line has a characteristic impedance of 300 Ω and terminated in a load Z_L = 150+j150 Ω. Find the following using smith chart. **[8]**

i) VSWR

ii) Reflection Coefficient.

iii) Input impedance at a distance 0.1λ from load.

iv) Input admittance from 0.1λ from load.

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