Total No. of Questions : 8]

SEAT No. :

P3504

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[5560]-154

T.E. (Electronics and Telecommunication)

ELECTROMAGNETIC AND TRANSMISSION LINES

(2012 Course) (Semester-I) (304181)

Time : 2½ 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 calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Derive the expression for electric field intensity $\vec{E}$ for infinite sheet of charge. **[8]**

b) Find the current crossing the portion of y = 0 plane defined by $-0.1 \leq x \leq 0.1$ m and $-0.002 \leq z \leq 0.002$m if $\vec{J} = 10^2 |x| \widehat{ay}$ where $\vec{J}$ is the current density. **[6]**

c) State and explain Biot-Savart law. **[6]**

OR

Q2) a) Derive boundary condition between conductor and free space. **[8]**

b) A point charge of 5 nC is located at the origin.If V=2 V at (0,6,-8), Find **[6]**

i) The potential at A (-3, 2, 6)

ii) The potential at B (1, 5, 7)

ii) Potential difference V_{AB}

c) State and prove Stoke's theorem **[6]**

Q3) a) What is poynting theorem? What is its significance? Derive the equation for poynting Theorem. **[10]**

b) Calculate the displacement current through parallel plate air filled capacitor having plates of area 10 cm^2 separated by a distance 2 mm connected to 300V, 1 MHz. **[8]**

OR

P.T.O.

Q4) a) What do you mean by uniform plane wave? Obtain equation of wave travelling in free space in terms of $\vec{E}$. **[10]**

b) In free space, $\vec{E}$ = 50 cos (ωt-βz) $\hat{a}_x$ V/m. Find the average power crossing a circular area of radius 2.5 m in the plane z=0. Assume Em=Hm.η0 and η0 = 120Π Ω. **[8]**

Q5) a) State primary and secondary constant of transmission line & hence derive relationship between primary & secondary constant of transmission line. **[8]**

b) The characteristics impedance of uniform transmission line is 2040 Ω at a frequency of 800 Hz. At this frequency, the propagation constant is 0.054/-87.9°. Find the values of R, L, G and C. **[8]**

OR

Q6) a) Derive the expression of characteristics impedance and propagation constant in terms of primary constant of transmission line. **[8]**

b) A transmission line has series inductance of 0.56 mH and capacitance of 0.1 μF per km. IF the losses due to conductor resistance and insulation leakage are negligible, calculate , **[8]**

i) Characteristics impedance

ii) Phase velocity.

Q7) a) What do you mean by single stub matching on a line and derive the equation of single stub along the line. **[8]**

b) Design a quarter wave transformer to match a load of 200 Ω to a source resistance of 500 Ω at operating frequency of 200 MHz. **[8]**

OR

Q8) a) Explain the phenomena of reflection of transmission line and hence define reflection coefficient. **[8]**

b) Write and explain any 4 properties of smith chart. **[8]**