

Code No: 54011

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

B.Tech II Year II Semester Examinations, May-2015

ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

(Common to ECE, ETM)

Time: 3 hours

Max. Marks: 75

Answer any five questions

All questions carry equal marks

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- 1.a) Seven identical charges of 9nC each are placed at a seven sides of a cube whose coordinates are (0,0,0),(2,0,0),(0,2,0),(0,0,2),(0,2,2),(2,0,2) and (2,2,0). Find the electric flux density at eighth side of that cube which is at (2,2,2).
b) Derive the expression for energy density in electrostatic fields. [8+7]
- 2.a) What are the different types of current densities explain.
b) Derive Poisson's and Laplace's equations from gauss's law?
c) Explain in brief about co-axial capacitors. [5+6+4]
- 3.a) Explain the concepts of scalar and vector potential.
b) Show that magnetic field due to a finite current element along Z-axis at a point P, 'r' distance away from Y axis is given by $\vec{H} = \frac{I}{4\pi r} (\sin \alpha_1 - \sin \alpha_2) \vec{a}_\phi$. Where I is the current through the conductor, α_1 and α_2 are the angles made by the tips of the conductor element at P. [7+8]
- 4.a) With necessary explanation derive the Maxwell's equations in differential and integral forms.
b) If $\vec{H} = 10 \sin(2 \times 10^8 t + 8x) \vec{a}_y$, A/m in a medium where relative permeability is 2 and relative permittivity is 1 and zero conductivity, determine \vec{B} and \vec{E} . [8+7]
- 5.a) Derive all the relations between \vec{E} and \vec{H} in a uniform plane wave.
b) Derive the expression for the attenuation and phase constants of uniform plane wave. [8+7]
- 6.a) State and explain poynting Theorem and mention its applications.
b) Define surface impedance, find surface impedance of a conductor at 1GHz, whose $\mu_{r1}=100$ and $\sigma_1=50M$ ohm/meter. [9+6]
- 7.a) What is loading. Explain different types of loading in transmission lines.
b) An 8Km transmission line is terminated by characteristic impedance Z_0 , the voltage at 1Km from the sending end is 10 percent below than at the sending end, What is the voltage across the load impedance in terms of percentage voltage at that sending end voltage? [8+7]
- 8.a) Explain in detail the configurations in Smith chart and list out the applications.
b) What is impedance matching? Explain various techniques in order to achieve impedance matching. [8+7]