R16

Code No: 135AP

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, October - 2020

ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

(Common to ECE, ETM)

Time: 2 hours **Max. Marks: 75**

Answer any five questions

All questions carry equal marks

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1.a) An infinitely long uniform line charge is located at $y = 3, z = 5$. If $\rho_l = 30nc/m$, find field E intensity at (i) origin (ii) P(5,6,1).

b) Derive the expression for point form of Gauss law. [8+7]

2.a) Develop an expression for potential due to dipoles.

b) Evaluate the electric field intensity at a point P (-5, 7, -4) in free space due to a charge of 0.2 milli coulombs placed at point R (2,-1,-2). [7+8]

3.a) State Ampere's law in integral form and derive the derivative form from it. Derive the continuity equation.

b) A 3 meter long straight conductor carries a current of 100A in the $+x$ direction. If the flux density is uniformly 2 Tesla and is parallel to xy plane, making an angle of 30^0 with the x axis, find the force on the conductor. [7+8]

4.a) Starting with Ampere's law, derive Maxwell's equation in integral form based on this law and obtain the corresponding differential equation by applying Stroke's theorem.

b) State and prove the boundary conditions for E and H fields for dielectric-conductor interface. [7+8]

5.a) Derive the relationship between E and H field and show that E/H=120 π

b) Write briefly about instantaneous, average and complex poynting vectors.

c) What is Brewster angle? What is its significant? [5+5+5]

6.a) Discuss the significant of the Poynting theorem and Poynting vector for energy relations in an electromagnetic field.

b) For a 10 MHz travelling wave with E_o=6 V/m find
i) Average poynting vector
ii) Peak energy density. [7+8]

7.a) Derive an expression for input impedance at any point in a transmission line.

b) Derive the secondary constants for a loss less transmission line. [8+7]

8.a) Explain the basis for construction of Smith chart. Illustrate as to how it can be used of an Admittance chart.

b) Sketch input impedance versus line length for shorted and open circuited line with $0 < l < \lambda$. [7+8]

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