Code No: 135AP **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, January/February - 2023

ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

(Electronics and Communication Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a) List the applications of Gauss's law. [2]
b) Differentiate between co-axial capacitors and parallel plate capacitors. [3]
c) What is magnetic susceptibility? [2]
d) Write the equation for work done in terms of force with a suitable figure. [3]
e) State Faraday's Law. [2]
f) What is meant by surface impedance? Derive an expression for the surface impedance for a perfect conductor. [3]
g) Discuss the physical significance of propagation constants. [2]
h) What is loading? Explain different types of loading in transmission lines. [3]
i) List out the applications of smith chart. [2]
j) Discuss the applications of transmission lines. [3]

PART - B

(50 Marks)

2.a) Explain the different types of charge distributions.
b) Derive an expression for electric field intensity for an infinite surface charge using gauss's law and brief the limitations of Gauss's law. [5+5]

OR

3.a) Derive expression for Poisson's and Laplace's Equations for a homogeneous medium.
b) For a line charge, $\rho_L = (10^{-12}/2)$ C/m on the z-axis, find V_{AB}, where A is $(4m, \pi/4, 0)$ and B is $(8m, \pi, 10m)$. [5+5]

4.a) Define ampere's circuit law and discuss its applications.
b) A circular loop of three units radius is centered at the origin in z=0 plane and carries a DC current of 10 mA, along ϕ direction. Find the magnetic flux density at $(0, 0, \pm 4)$. [5+5]

OR

5.a) Derive an expression for transformer EMF.
b) A certain material has $\sigma = 0$ and $\varepsilon_r = 1$ if $\vec{H} = 4\sin(10^6 t - 0.01z)\vec{a}_y$ A/m. Use Maxwell's equations to find μ_r. [5+5]

6.a) Derive the relation between E and H in a uniform Plane Wave.

b) A plane wave propagating incident obliquely from conductor to free space. Derive the equations for reflection and transmission coefficient. [5+5]

OR

7.a) State and Explain pointing theorem.

b) Define Brewster and critical angle. [5+5]

8.a) Discuss various types of transmission lines with necessary diagrams.

b) What is the difference between lumped and distributed parameters? Discuss in detail. [5+5]

OR

9.a) A transmission line of length 70 m is terminated with an impedance of $Z_1 = 125+j48$. If the frequency is 3 MHz and the characteristic impedance is 230 ohm, find the sending end impedance.

b) Discuss the conditions for distortion less line. [5+5]

10.a) Define and derive an expression for reflection coefficient of a transmission line and how it related to SWR?

b) Discuss about impedance transformation of half wavelength and Quarter Wave length line. [5+5]

OR

11.a) Write about constant-r and x circles of smith chart.

b) Write in brief single stub matching. [5+5]

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