Code No: 155SE **RA**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, January/February - 2023
ELECTROMAGNETIC FIELDS AND WAVES
(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.

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PART – A

(25 Marks)

1.a) State Gauss Law. [2]
b) What are the significant physical differences between Poisson's and Laplace's equations? [3]
c) What is Lorentz force? [2]
d) Define Magnetic Flux Density in two different forms. [3]
e) What is transformer e.m.f? [2]
f) Explain "Inconsistency of Ampere's law"? [3]
g) Define Uniform plane waveform. [2]
h) Derive the expressions for α and β in a good conductor. [3]
i) What is meant my TE 10 mode? [2]
j) What is the difference between phase velocity and group velocity? [3]

PART – B

(50 Marks)

2.a) State and explain coulomb's law with necessary equations.
b) Find the electric field intensity at P (1,1,1) caused by four identical 3nC charges located at P1 (1,1,0), P3(-1,-1,0) and P4 (1,-1,0). [5+5]

OR

3.a) Define electric field intensity at a point. Derive the expression **E** of a line charge.
b) Obtain the expression for capacitance of a spherical capacitor. [5+5]

4.a) State and Explain Biot-Savart's law.
b) A charge of 12C has a velocity of $5a_x + 2a_y - 3a_z$ m/s. Determine F on the charge in the field of $B = 4a_x + 4a_y + 3a_z$ Wb/m^2. [5+5]

OR

5.a) Find the magnetic field produced at a point due to the current in a small element wire by using Biot-Savart's law.
b) Find H at the centre of a square current loop of side '*l*' by using Biot-Savart's law. [5+5]

6.a) State and explain faradays law.
b) Differentiate Conduction and Displacement Current Densities. [5+5]

OR

7.a) State Maxwell's Equations in differential form and Integral form. And write their word statements.
b) State Boundary Conditions for dielectric-dielectric interface. [5+5]

8. Derive the relation between E and H in uniform plane wave propagation. [10]

OR

9. A uniform plane wave is normally incident from air on a perfect conductor. Determine the resulting E and H fields. Sketch their variations. [10]

10. Describe rectangular waveguide in TE and TM mode. [10]

OR

11. Derive the wave equations for TE mode. [10]

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