R20 Regulation *Subject code:* **3P4DE**

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech IV Semester Regular Examinations, July 2022

ELECTROMAGNETIC THEORY AND TRANSMISSION LINES
(ELECTRONICS & COMMUNICATION ENGINEERING)

Maximum Marks: 70 Date:30.07.2022 Duration: 3 hours

Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10x2M=20 Marks)

1 State Coulomb's Law.
2 Define Electric potential.
3 State Ampere circuital law.
4 State Faraday Law.
5 What is Brewster's angle?
6 Write the wave equation in a conducting medium.
7 Define the Propagation constant.
8 Give the relation between series impedance, shunt admittance and Characteristic impedance of a Transmission line.
9 Determine the reflection coefficient of a transmission line when $Z_R = 200\ \Omega$ and $Z_0 = 100\ \Omega$.
10 What are the difficulties in single stub matching?

Part-B

Answer All the following questions. (10MX 5=50Marks)

11 A. Using Gauss's law, derive the expressions for electric field intensity and electric flux density due to an infinite sheet of conductor of charge density ρ C/•m. [5M]
B. Compare and explain Convection and Conduction Currents. [5M]

OR

12 A. Explain Poisson's and Laplace's Equations. [5M]
B. Derive an expression for the capacitance of the Parallel plate capacitor. [5M]

13 A. Explain the concept of Magnetic vector potential. [5M]
B. Given Magnetic Vector potential $A = -\frac{\rho^2}{4}\overline{a_z}$ wb/m, Calculate the total magnetic flux crossing the $\varphi=\frac{\pi}{2}$, $1 \le \rho \le 2m, 0 \le z \le 5m$ [5M]

OR

14 A. What is displacement current? Obtain an expression of displacement current for a charged capacitor. Write Ampere-Maxwell's law. [5M]
B. Write Maxwell's Equations in Different Final Forms. [5M]

15 A. The magnetic field component of an EM wave propagating through a non-magnetic dielectric medium is given by $\vec{H} = 6\cos(2\times10^8 t - 6x)\widehat{a_y}$ A/m. Determine the permittivity of the medium and the electric field intensity. [5M]

B. Material has a dielectric constant of 25 and conductivity 2×10^6 ℧/m. What is the frequency above which the material cannot behave like a good conductor? If a plane wave of 10MHz is incident on the material, effectively up to what depth the wave can penetrate the material, and what will be the wavelength of the wave inside the material? [5M]

OR

16 How is power flow referred to by using Poynting Vector? Explain Poynting's theorem. Explain its significance. [10M]

17 A. What are the different types of transmission lines? Explain [5M]

B. Derive Propagation constant and characteristic Impedance of Lossless Transmission line. [5M]

OR

18 A. What is loading? Explain different types of loading? [5M]

B. Discuss the two types of waveform distortion on a transmission line and obtain the condition for distortion less line. [5M]

19 A. A lossless 100 Ohms transmission line is terminated in 200 +j200 Ohms. Find
a) Voltage reflection coefficient
b) VSWR
c) Impedance 0.375 from load
d) shortest length of line for which impedance is purely resistive and
e) the value of this resistance. [5M]

B. Using a slotted line, the following results were obtained: distance of the first minimum from the load = 4 cm; the distance of the second minimum from the load = 14 cm; voltage standing-wave ratio = 1.5. Find the load impedance if the line is lossless and Z0 = 50 Ω. [5M]

OR

20 Explain reflection coefficient and VSWR. [10]