JHARKHAND UNIVERSITY OF TECHNOLOGY

Diploma 3rd Semester Sample Paper (DIPLOMA WALLAH)

ELECTRONICS MEASUREMENTS & TESTTING TECHNIQUES (EMTT)

More Model Sets & Study Materials available here DiplomaWallah.in

Time: 3 Hours **Full Marks: 70** **SET: 2**

INSTRUCTIONS:

1. Question No. 1 is Compulsory.
2. Answer any **FOUR** questions from the remaining (Q.2 to Q.7).
3. **Important:** Students are advised to draw relevant diagrams (Vectors, Transmission Lines, Graphs) for figure-based questions on their own.

Q.1. Multiple Choice Questions [2 × 7 = 14]

(i) The velocity of an EM wave in free space is given by:

(a) $1 / \sqrt{(\mu_0 \varepsilon_0)}$ (b) $\sqrt{(\mu_0 \varepsilon_0)}$

(c) μ_0 / ε_0 (d) ε_0 / μ_0

(ii) Which vector identity is correct?

(a) $\nabla \cdot (\nabla \times A) = 0$ (b) $\nabla \times (\nabla V) = 1$

(c) $\nabla \cdot D = \rho v$ is False (d) None

(iii) Standing Wave Ratio (SWR) varies between:

(a) 0 to 1 (b) 1 to ∞

(c) -1 to +1 (d) 0 to ∞

(iv) The skin depth (δ) is proportional to:

(a) Frequency (f) (b) $1 / \sqrt{f}$

(c) $\sqrt{f}$ (d) f^2

(v) Reflection coefficient (Γ) for a matched line ($Z_L = Z_0$) is:

(a) 1 (b) -1

(c) 0 (d) ∞

(vi) Ampere's Circuital Law is analogous to which law in Electrostatics?

(a) Lenz's Law (b) Gauss's Law

(c) Coulomb's Law (d) Kirchhoff's Law

(vii) Lossless transmission line condition is:

(a) R=0, G=0 (b) R=G

(c) L=C (d) $R \neq 0$

SECTION B (LONG ANSWER TYPE)

Q.2. (a) State and prove **Poynting Theorem**. What is the physical significance of the **Poynting Vector (P = E × H)**? [7]

Q.2. (b) A uniform plane wave is propagating in a good conductor. Derive the expression for **Skin Depth (δ)**. Explain its dependence on frequency and conductivity. [7]

Q.3. (a) Derive the **Wave Equation** for a conducting medium for **Electric Field (E)** and **Magnetic Field (H)** starting from Maxwell's equations. [7]

Q.3. (b) Compare **Conduction Current** and **Displacement Current**. Find the displacement current density in a dielectric with $\varepsilon_r = 10$ if $E = 100 \sin(100t)$ V/m. [7]

Q.4. (a) Derive the expression for **Input Impedance (Z_{in})** of a transmission line of length 'l' terminated by load Z_L. [7]

Q.4. (b) Explain the cases of Input Impedance for:

1. **Short Circuited Line** ($Z_L = 0$)
2. **Open Circuited Line** ($Z_L = \infty$)
3. **Matched Line** ($Z_L = Z_0$) [7]

Q.5. (a) Define **Reflection Coefficient (Γ)** and **Voltage Standing Wave Ratio (VSWR)**. Derive the relation: $VSWR = (1 + |\Gamma|) / (1 - |\Gamma|)$. [7]

Q.5. (b) A lossless transmission line with $Z_0 = 50\ \Omega$ is terminated by a load of 100 Ω. Calculate the Reflection Coefficient and VSWR. [7]

Q.6. (a) Explain **Ampere's Circuital Law**. Use it to find the Magnetic Field Intensity due to an **Infinite Sheet of Current**. [7]

Q.6. (b) Derive the expression for **Capacitance of a Parallel Plate Capacitor** using Laplace's Equation or Gauss's Law. [7]

Q.7. Write Short Notes on (Any FOUR): **[3.5 × 4 = 14]**

a. Stokes' Theorem
b. Faraday's Law of Induction
c. Phase Velocity vs Group Velocity
d. Polarization of EM Waves
e. Magnetic Vector Potential

Diploma Wallah: Solution Key

MCQ Answers: (i) a, (ii) a, (iii) b, (iv) b, (v) c, (vi) b, (vii) a.

Q3(b) Hint: $Jd = \varepsilon (\partial E / \partial t)$. $Jd = 10\varepsilon_0 \times 100 \times 100 \cos(100t)$.

Q5(b) Solution:
$\Gamma = (ZL - Z0) / (ZL + Z0) = (100 - 50) / (100 + 50) = 50/150 = \mathbf{0.33}$
$VSWR = (1 + 0.33) / (1 - 0.33) = 1.33 / 0.67 = \mathbf{2}$.

Made With 💗 by Sangam (Diploma Wallah)