

- f. The lowest order TM mode in rectangular wave guide of cross dimension $a \times 0.5a$ is
- (A) TM_{01} (B) TM_{11}
 (C) TM_{10} (D) TM_{20}
- g. Which term is the radiation term?
- (A) $\frac{1}{r}$ term (B) $\frac{1}{r^2}$ term
 (C) $\frac{1}{r^3}$ term (D) all of the above
- h. The critical frequency of an ionospheric layer depends upon
- (A) only height
 (B) only electron density
 (C) both height & electron density & nothing else
 (D) height, electron density & angle of incidence
- i. What is the unit of magnetic charge?
- (A) ampere-meter square (B) coulombs
 (C) amperes (D) ampere-meter
- j. The property of a material which opposes the production of magnetic flux in it, is known as
- (A) permittivity (B) permeance
 (C) reluctance (D) mmf

**Answer any FIVE Questions out of EIGHT Questions.
 Each question carries 16 marks.**

- Q.2** a. Find the force on a $100\mu\text{C}$ charge at $(0, 0, 3)$ m if four like charges of $20\mu\text{C}$ are located on the x & y axes at ± 4 m. (8)
- b. Explain Gauss's law with appropriate equation. Also give its modified version. (6)
- c. Determine the capacitance of a parallel plate capacitor composed of tin-foil sheets of 20cm^2 , separated by a 0.6 cm thick glass dielectric of relative permittivity 6. (2)
- Q.3** a. Write Biot-Savart's law to find magnetic flux density due to a current element. Also explain Ampere's law for current element. (6)
- b. Develop an expression for the magnetic field at any point on the line through the centre, at a distance 'h' from the centre & perpendicular to the plane of a circular loop of radius 'a' & carrying current I. (10)

- Q.4** a. Write Maxwell's equations in point form & integral form for static fields with the related law. Also give the equation of continuity for steady current. (7)
- b. Write and derive Stoke's and Divergence theorem. (9)
- Q.5** a. The magnetic field intensity of a uniform plane wave in air is 20A/m in y direction. The wave is propagating in z direction at a frequency of 2×10^9 rad/sec. (5)
 Find : (i) frequency in Hz.
 (ii) period
 (iii) wavelength
 (iv) amplitude of electric field intensity
 (v) direction of \vec{E}
- b. The material parameters of a certain food item are given by $\sigma = 2.17 S / m$, $\epsilon = 47\epsilon_0$, and $\mu = \mu_0$ at the operating frequency $f = 2.45$ GHz of a microwave oven. Find the propagation parameters $\alpha, \beta, \lambda, \nu_p$ & $\bar{\eta}$. (8)
- c. Define three types of Polarization of waves. (3)
- Q.6** a. Discuss two applications of properties of the input impedance of a short circuited line. (12)
- b. Explain the block diagram of a time-domain reflectometer to locate discontinuities in transmission line system. (4)
- Q.7** a. What do you understand by rectangular cavity resonator? (9)
 Derive the expression for the frequencies of oscillation for it.
- b. A hollow rectangular wave-guide has inner dimension of $8\text{cm} \times 4\text{cm}$. Find the cut-off frequency in TE_{10} , TE_{01} & TE_{11} mode. Why TE_{10} modes is dominant mode. (7)
- Q.8** a. Discuss the principle of a broadband array using as an example of the log periodic dipole array. (6)
- b. Derive the equation of effective area for Hertzian dipole. (10)
- Q.9** Write notes on (16)
- (i) Maximum usable frequency & optimum frequency of a layer.
 (ii) Voltage Standing Wave Ratio (VSWR) and reflection coefficient