T.E. Electronic sem V Exam Rev 28 May 20
Electromagnetic Engineering

Con. 3522-10. **(REVISED COURSE)** **AN-4207**

(3 Hours) **[Total Marks : 100**

N.B. (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from the **remaining** questions.
(3) Assume any **suitable** data wherever **necessary**.
(4) Use of Smith chart is **allowed**.

1. (a) Explain parallel polarisation. 5
   (b) What is intrinsic impedance of free space ? 5
   (c) Derive transmission line equation. 5
   (d) Explain the concept of displacement current. 5

2. (a) Derive Maxwell's equation in integral form. 10
   (b) What is a uniform plane wave ? Stating from Maxwell equation derive wave equation for free space. 10

3. (a) The electric field intensity associated with a plane wave travelling in a perfect dielectric medium is given by — 10
   $$E_x (z, t) = 10 \cos (2\pi \times 10^7 t - 0{\cdot}1\pi x) \text{ v/m}$$
   (i) What is velocity of propagation ?
   (ii) Write down an expression for magnetic field intensity associated with the wave if $\mu = \mu_o$
   (b) The net electric field at the boundary of two regions is $30 \angle 0°$ v/m. The region 2 is free space and properties of region 1 are $\varepsilon_r = 9$ and $\mu_r = 1$. Using the phase method, calculate E_{x1} and H_{y1} at d = 1 cm and d = 2 cm; if the wave frequency is 1250 MHz. 10

4. (a) Show the circuit representation of parallel plane transmission line and derive characteristic impedance. 10
   (b) Show that a co-axial line having an outer conductor of radius 'b' is having a minimum attenuation when radius 'a' of inner conductor satisfies the ratio b/a = 3·6 10

5. (a) Explain potential functions for sinusoidal radiation oscillations. 10
   (b) Match load impedance of $Z_L = 100 + j80\ \Omega$ to a 50 Ω line using a single series open circuited stub. Use Smith chart. 10

6. (a) Explain various types of electromagnetic interferences. 10
   (b) State boundary condition in scalar and vector form. 10

7. (a) For electromagnetic wave prove that E × H = 0 and E × H is having the direction of propagation of the wave. 10
   (b) If the characteristic impedance of the line is 50 Ω and VSWR = e = 2; when the line is loaded. When the load is shorted, the minima shift is 0·15 X towards the load. Determine load impedance using Smith chart. 10