SEM V ELEX EME 15/5/14

QP Code : **MV-18401**

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

N. B. : (1) Question **No. 1** is **compulsory.**
(2) Attempt any **four** questions from Q. No. **2** to **7.**
(3) Vector notation should be used wherever necessary.
(4) Assumptions made should be clearly stated.

1. (a) Derive wave equations for homogeneous unbounded source free medium starting with Maxwell's equations. **5**
(b) Derive Poisson's and Laplace's equations. **5**
(c) State the characteristics of Smith Chart. **5**
(d) In a medium characterized by **5**
$\sigma = 0$, $\mu = \mu_o$ and $\varepsilon = \varepsilon_o$.
$\vec{E} = 20 \sin(10^8 t - \beta z)\vec{a}_y$ V/m
Find β and $\vec{H}$.

2. (a) Derive boundary conditions for electric and magnetic fields at the boundary of two dielectric media. **10**
(b) For an electromagnetic wave prove that $\vec{E}.\vec{H}$ and $\vec{E}\times\vec{H}$ gives the direction of propagation of the wave. **10**
(c) Determine Υ and η at 100 MHz for a medium in which $\mu r = 1$, $\varepsilon_r = 10$, $\sigma = 0$. At what velocity will an EM wave travel in this medium? **10**

3. (a) State and prove Poynting theorem. Explain the integrals involved in the statement. **10**
(b) Explain various types of electromagnetic interferences. **10**

4. (a) Derive the expressions for the reflection and transmission coefficients in case of reflection from perfect dielectric at normal incidence. **10**
(b) Explain Brewster angle. Derive the expression for it. **5**
(c) Determine the amplitudes of the reflected and transmitted E and H fileds at the interface of two regions at z = 0. **5**
Given : Incident Ei = 1 mV/m, $E_{r1} = 3.5$, $\mu_{r1} = 1$, $\sigma_1 = 0$.
Region 2 is free space.

5. (a) A 50Ω transmission line is to be matched to a load of 50 + j75Ω using a short circuited stub. Use Smith Chart to design the minimum length of the stub and minimum distance of the stub from the load. **8**
(b) Explain the use of a loss-less transmission line as circuit elements at UHF. **7**
(c) Find the input inpedance, VSWR and reflection coefficient at 0.6λ from the load $Z_L = 60\text{-}j30\,\Omega$. Given : Zo = 50Ω. **5**

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6. (a) Explain potential functions for sinusoidal radiation oscillations. 5
   (b) For silver, $\sigma = 3$ MS/m. At what frequency will the depth of penetration, δ, be 1 mm? 5
   (c) Define polarizationof a wave Explain the types of polarization. 10

7. Write a short note on :–
   (a) The need of electromagnetic compatibility 7
   (b) Surface impedance of a conductor 7
   (c) Wave propagation in dispersive media. 6
