INTERNATIONAL CENTRE FOR APPLIED SCIENCES
MAHE, MANIPAL

B.Sc. (Applied Sciences) in Engg.

End – Semester Theory Examinations – Nov./ Dec. 2020

III SEMESTER - ELECTROMAGNETIC THEORY (IEC 233)

(Branch: E&E)

Time: 3 Hours **Date: 23 November 2020** **Max. Marks:50**

- ✓ **Answer ALL the questions.**
- ✓ **Missing data, if any, may be suitably assumed**

1. (a) Derive the boundary relations for Dielectric-Dielectric &Dielectric – conductor interfaces for static electric field.

   (b) If $\mu_r = 24, \varepsilon_r = 13.55$ and $\overline{H} = 2\cos(10^{10}t - \beta x)\overline{a_z}$ A/m, using Maxwell's equation, find $\overline{B}, \overline{D}, \overline{E}$ and β. **(5+5)**

2. (a) A uniform plane wave propagating in perfect dielectric medium has

   $\overline{E} = 500\cos(10^7 t - \beta z)a_x$ V/m and $\overline{H} = 1.1\cos(10^7 t - \beta z)a_y$ A/m , if the wave is travelling with a velocity $u = 1.5X10^8 m/s$, Find $\varepsilon_r, \mu_r, \beta, \lambda$ and η

   (b) Derive an expression for energy stored in an electrostatic. Write an expression for stored Energy due to a uniform line charge distribution. **(5+5)**

3. (a) Find the equation of streamline that passes through the point P(-2,7,10) in the field $\overline{E} = 2(y-1)\overline{a_x} + 2x\overline{a_y}$

   (b) Find the capacitance of two parallel plate capacitor using Laplace's Equation if both the plates are separated at a distance of'd' in $\overline{a_x}$ direction. **(5+5)**

4. (a) A charge Q_A =-20μC is located at A (-6, 4, 7) and another charge Q_B=50μC is located at B (5, 8,-2) in free space. Find

   (i) $\overline{R}_{AB}$

   (ii) $|R_{AB}|$

   (iii) Determine the force exerted on Q_A by Q_B if $\varepsilon_0 = 8.854X10^{-12} F/m$

   (b) Write notes on (i) Phase Velocity (ii) Wave polarization (iii) Reflection coefficient **(5+5)**

5. (a) Derive Maxwell's curl equation in both point and integral form from starting fundamentals.

   (b) Define and explain (i) SWR (ii) Intrinsic Impedance (iii) Displacement Current. **(5+5)**

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