*Time: 1. Hour* **EE302 - ELECTROMAGNETICS** *Max. Mark: 20*

# NSS COLLEGE OF ENGINEERING, PALAKKAD

Govt. Aided College Affiliated to APJ Abdul Kalam Technological University
Approved by AICTE

**SIXTH SEMESTER B.TECH DEGREE 2 nd SERIES EXAMINATION JULY 2020**

*Department of Electrical & Electronics Engineering*

**PART A -Answer all question (Each question carries 2 Marks)**

**1)** **a)** At the boundary between a conductor and free space, compute the magnitude of surface charge density, magnitude of normal and tangential component of electric field intensity, if $\bar{E} = 9\overline{a_x} - 4\overline{a_y} + 1.5\overline{a_z}$. **(1)**

**b)** Compute the magnitude of current passing through the surface of a sphere of radius 0.05 m if conduction current density vector is represented as $200000000\ (\sin\theta)\ \overline{a_r}$ . **(1)**

**2)** **a)** Using Poynting theorem prove that the average power flow along a concentric cable is the product of voltage and current. **(1)**

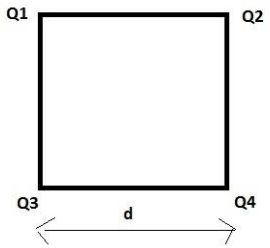
**b)** For time invariant fields, Apply Maxwell's second equation to find out conduction current density vector if $\overline{H} = [6xsin\alpha + 2y^2cos\beta]\overline{a_z}$ . **(1)**

**3)** **a)** Calculate the distance through which a wave can propagate in through a good conductor so that its amplitude get attenuated to nearly 37 percent of its actual value. The frequency of the wave is 2 MHz and the conductivity of the material is 48μΩ/m and permeability is 1.5 μH/m. **(1)**

**b)** Calculate the wavelength of a uniform plane wave propagating through air in z direction with a frequency of 2 GHz. The magnetic field intensity of the wave in air is 40 A/m in $\overline{a_y}$ direction. **(1)**

**PART B - Answer all Questions (Questions 4 & 6 carries 5 marks and Question 5 carries 4 Marks)**

**4)** Compute the magnitude of electrostatic energy stored in the given system if $Q_1$ = 1nC, $Q_2$ = 2nC ,$Q_3$ =3nC , $Q_4$ = 4nC and d = 2m **(5)**




**5)** Let μ = b and ϵ = c, then compute the value of b if the given fields $\bar{E} = 60sin(10^6t)\sin(0.01z)\overline{a_x}$ V/m and $\bar{H} = 0.6cos(10^6t)\sin(0.01z)\overline{a_y}$ A/m satisfies Maxwell's equations. **(4)**

**6)** Calculate a) Attenuation constant b) Phase Constant c) velocity of propagation, d) wavelength and e) intrinsic impedance for a uniform plane wave propagating in a lossy dielectric characterized by $\varepsilon_r$ =2.5, $\mu_r = 4$ and $\sigma = 10^{-3}$ Ʊ/m at a frequency 10MHz. **(5)**