VIT
Vellore Institute of Technology

SCHOOL OF ELECTRONICS ENGINEERING

Continuous Assessment Test - II, August 2019 **Fall Semester, 2019-2020**

Course Code : ECE1017 **Duration** : 90 Mins

Course Name : Electromagnetic Field Theory and Transmission Lines **Slot** : B1

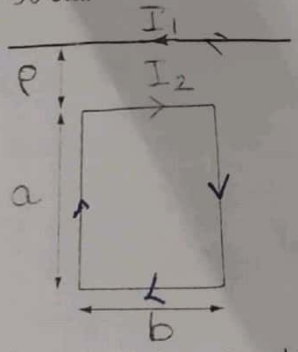
Max. Marks : 50 **Faculty-In-Charge**: Dr Sangeetha S

Answer All the Questions

1. In a certain conducting region, $\vec{H} = y\,(x^3 + y^2)\hat{a}_x - y^2xz^2\,\hat{a}_y + 4x^2y^2z\,\hat{a}_z$ A/m. (i) Determine current density at (5, 2, -3) (ii) Find the current passing through $x = -5$, $0 < y < 6$, $0 < z < 5$. (10)

2. A current distribution through a wire gives rise to the vector magnetic potential $\vec{A} = xy\,\hat{a}_x + y^3x\,\hat{a}_y - 4xz\,\hat{a}_z$ Wb/m. Calculate (a) Magnetic flux density at (- 2, 2, 6) (b) Flux through the surface defined by $z = 1$, $0 \le x \le 1$, $-1 \le y \le 4$. (c) The flux through the surface defined by $\phi = \pi/2$, $2 \le \rho \le 4$ m, $0 \le z \le 6$ m (10)

3. A rectangular loop carrying current I_2 is placed parallel to an infinitely long filamentary wire carrying current I_1 as shown in Figure. Find the force experienced by the loop if $I_1 = 10$ A, $I_2 = 5$ A, $\rho = 20$ cm, a = 10 cm, b = 30 cm. (10)



4. (a) A 50 V generator at 20 MHz is connected to the plates of an air dielectric parallel plate capacitor with plate area 2.8 cm^2 and separation distance 0.2 mm. Find the maximum value of displacement current density and displacement current. (5)

(b) Region 1 ($x \ge 2$) is a dielectric with relative permittivity 2, while region 2 ($x < 2$) has relative permittivity of 5. Let $\vec{E}_1 = 20\hat{a}_x - 10\hat{a}_y + 50\hat{a}_z$. Calculate the Electric field and Electric flux density in the region 2. (5)

5. A 1 kV/m plane wave of 1 GHz travels in the 'z' direction in an lossy medium with $\varepsilon_r = 9$, $\mu_r = 2$, $\sigma = 0.08$ S/m. Calculate (i) Attenuation constant (ii) Phase constant (iii) Velocity of propagation (iii) Intrinsic impedance (iv) Time domain electric field and magnetic field equations. (v) time average power. (10)