B.TECH. SEM -V (E & TC ENGG.) 2014 COURSE (CBCS) : SUMMER - 2018

SUBJECT : ELECTROMAGNETIC ENGINEERING

Day : **Friday** | Time : **10.00 AM TO 01.00 PM**

Date : **25/05/2018** | **S-2018-2384** | Max. Marks : 60

N.B.

1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.

Q.1 **a)** Given P(-2, 6,3) and vector $\vec{A} = y\hat{a_x} + (x+z)\hat{a_y}$. Express P and $\vec{A}$ in cylindrical co-ordinate system. **(05)**

b) State and explain Stoke's Theorem. **(05)**

OR

Q.1 **a)** Determine the divergence of these vector fields : **(05)**

i) $\vec{P} = x^2yz\hat{a_x} + xz\hat{a_z}$

ii) $\vec{Q} = \rho\sin\phi\hat{a_\rho} + \rho^2z\hat{a_\phi} + z\cos\phi\hat{a_z}$.

b) Find the laplacian of the scalar fields: **(05)**

i) $V = e^{-z}\sin 2x\cos hy$

ii) $U = \rho^2 z\cos 2\phi$

Q.2 **a)** Derive an expression to find out the electric field intensity due to surface charge distribution. **(05)**

b) Determine $\vec{D}$ at (4, 0, 3) if there is a point charge $-5\pi\, mC$ at (4, 0, 0) and a line charge $3\pi\, mC/m$ along the y-axis. **(05)**

OR

Q.2 **a)** What is the boundary condition for electrostatic field? **(05)**

b) Given that $\vec{D} = z\rho\cos^2\phi\,\hat{a_z}C/m^2$, calculate the charge density at $(1, \pi/4, 3)$ and the total charge enclosed by the cylinder of radius 1m with $-2 \le z \le 2m$. **(05)**

Q.3 **a)** State and explain Biot- Savart's Law. **(05)**

b) Find out the magnetic field distribution for an infinitely long co-axial cable using Ampere's law. **(05)**

OR

Q.3 **a)** State and explain Ampere's circuital law. **(05)**

b) The xy-plane serves as the interface between two different media. Medium1(z<0) is filled with a material whose $\mu_r = 6$ and medium 2(z>0) is filled with a material whose $\mu_r = 4$. If the interface carries current $(1/\mu_0)\hat{a_y}\, mA/m$, and $\vec{B_2} = 5\hat{a_x} + 8\hat{a_z}\, mWb/m^2$. Find $\vec{H_1}$ and $\vec{B_1}$. **(05)**

P.T.O.

Q.4 **a)** Explain Maxwell's equations in point forms. **(05)**

b) What is the difference between displacement current and conduction current? **(05)**

OR

Q.4 **a)** State and explain Faraday's law. **(05)**

b) In medium characterized by $\sigma = 0,\ \mu = \mu_0,\ \varepsilon_0$ and $\vec{E} = 20\sin(10^8\,t - \beta z)\hat{a}_y\, V/m$, calculate β and $\vec{H}$. **(05)**

Q.5 **a)** A uniform plane wave propagating in a medium has: $\vec{E} = 2e^{-\alpha z}\sin(10^8\,t - \beta z)\hat{a}_y\, V/m$ .If the medium is characterized by $\varepsilon_r = 1, \mu_r = 20, \sigma = 3S/m$. Find α, β and $\vec{H}$ **(06)**

b) State and explain Poynting Theorem. **(04)**

OR

Q.5 **a)** What is the electric and magnetic field of a plane wave at normal incidence. **(06)**

b) What is Helmholtz equation? **(04)**

Q.6 **a)** What is characteristic impedance? Express the transmission line equations. **(05)**

b) Define the following terms: **(05)**
i) Input impedance
ii) Standing wave ratio

OR

Q.6 **a)** An air line has a characteristic impedance of 70 Ω and a phase constant of 3rad/m at 100 MHz. Calculate the inductance per meter and the capacitance per meter of the line. **(05)**

b) What is current reflection coefficient? Explain it. **(05)**

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