B.Tech. SEM -V (E & TC Engg.) 2014 Course (CBCS) : WINTER - 2018

SUBJECT: ELECTROMAGNETIC ENGINEERING

Day: Saturday
Date: 01/12/2018

Time: 02.30 PM TO 05.30 PM
Max Marks: 60

W-2018-2439

N.B.:

1) All questions are **COMPULSORY.**
2) Figures tot eh right indicate **FULL** marks.
3) Assume suitable data if necessary.

Q.1 **a)** Given a point P (-1, 4, 2) and vector $\vec{A} = y\hat{a}_x + (x+z)\hat{a}_y$. Express P and $\vec{A}$ in Cartesian and cylindrical system. **(05)**

b) Explain the concept of gradient and curl. **(05)**

OR

Q.1 **a)** Prove for a scalar field V, $\nabla \times \nabla V = 0$ that is curl of gradient of any scalar field, vanishes. **(05)**

b) Find out gradient of the following scalar fields: **(05)**

i) $V = \sin 2x \cosh y$

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

Q.2 **a)** What is Stoke's law? Explain it. **(05)**

b) Explain the dielectric –dielectric boundary conditions of the electric field. **(05)**

OR

Q.2 **a)** What is Coulomb's law? What is electric flux density? **(05)**

b) Explain Guass's law. Find out the field distribution of an infinite sheet of charge. **(05)**

Q.3 **a)** What is Ampere's Circuital law? Explain the magnetic field intensity through infinitely long co-axial transmission line. **(05)**

b) The x-y plane serves as the interface between two different media. Medium1 ($z < 0$) is filled with a material whose $\mu_r = 6$, Medium2 ($z > 0$) is filled with a material whose $\mu_r = 4$. If the interface carries current $(1/\mu_0)\ \hat{a}_y$ mA/m. $\vec{B}_2 = 5\hat{a}_x + 8\hat{a}_z$ mWb/m^2. Find $\vec{H}_1$ *and* $\vec{B}_1$. **(05)**

OR

Q.3 **a)** What is Biot's Savart law? Explain it. **(05)**

b) Planes z = 0, z = 4 carry current of $-10\hat{a}_x$ A/m and $10\hat{a}_x$ A/m respectively. Determine $\vec{H}$ *at* (1,1,1). **(05)**

P.T.O.

Q.4 **a)** What is the inconsistency of Ampere's law? **(05)**

b) State Faraday's law and explain it. **(05)**

OR

Q.4 **a)** Define the continuity equation. **(05)**

b) A parallel plate capacitor with plate area of $5cm^2$ and plate separation of 3 mm has a voltage $(50\sin 10^3 t)$ V applied to its plates. Calculate the displacement current assuming $\varepsilon = 2\varepsilon_0$. **(05)**

Q.5 **a)** Find out the plane wave equation in good conductor. **(05)**

b) What is skin depth? Explain it with neat and clean diagram. **(05)**

OR

Q.5 **a)** What is the difference between phase velocity and group velocity? **(05)**

b) What are the characteristics of plane wave in dielectric media and conducting media? **(05)**

Q.6 **a)** What is VSWR? **(05)**

b) Define input impedance. **(05)**

OR

Q.6 **a)** What is reflection coefficient? **(05)**

b) A distortionless line has $Z_0 = 60\ \Omega$, $\alpha = 20$ mNp/m, u = 0.6c, where c is the speed of light in a vaccum. Find R, L,G,C and λ at 100 MHz. **(05)**

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