

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 to the 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)  $U = \rho^2 z \cos 2\phi$

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 Gauss'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. Medium 1 ( $z < 0$ ) is filled with a material whose  $\mu_r = 6$ , 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.  $\vec{B}_2 = 5\hat{a}_x + 8\hat{a}_z$  mWb/m<sup>2</sup>. 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  $5\text{cm}^2$  and plate separation of 3 mm has a voltage  $(50\sin 10^3 t)$  V applied to its plates. Calculate the displacement current assuming  $\epsilon = 2\epsilon_0$ . (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  $Z_0 = 60 \Omega$ ,  $\alpha = 20 \text{ mNp/m}$ ,  $u = 0.6c$ , where  $c$  is the speed of light in a vacuum. Find  $R, L, G, C$  and  $\lambda$  at 100 MHz. (05)

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