1T00835 - T.E.(Electrical Engineering)(SEM-V)(Choice Base Credit Grading System ) (R- 19) ( C Scheme) / 32024 - Electromagnetic Field & Wave

QP ODE: 10038206 DATE: 1/12/2023

**Time–3 Hours** **Total Marks-80**

**N.B.: - (1) Question No.1 is compulsory.**
**(2) Attempt any Three questions out of remaining five questions.**
**(3) Assume suitable data if necessary and justify the same.**

Q 1. Answer **any four questions**.

A) Draw rectangular, cylindrical and spherical co-ordinate system and explain differential element $\overline{dl}$ ,differential surface $\overline{ds}$ and differential volume dv for all co-ordinate system **05**

B) Derive relationship between electric potential V and electric field intensity $\overline{E}$. **05**

C) Explain Lorentz force equation for a moving charge and its applications **05**

D) Derive Poisson's and Laplace's equation for a dielectric medium. **05**

E) Compare electric and magnetic fields using any five points. **05**

Q2 a) Derive electric field intensity $\overline{E}$ due to infinite line charge with charge density $\rho_l$ C/m. **10**

Q 2 b) Two point charges -4µc and 4 µc are located at (2,-1,3)m and (2,-1.-3)m respectively in free space. Find the force and electric field on 1 µc charge at origin (0,0,0)m. **10**

Q 3 a) Derive magnetic field intensity $\overline{H}$ due to an infinite straight conductor carrying a current I. **10**

Q 3 b) For current density $\overline{J} = 10z\sin^2\phi\overline{a_\rho}$ A/m$^2$.Find the current through cylindrical surface $\rho$ =2m,1≤z≤5m. Draw the circuit diagram and analyze the direction of current. **10**

Q 4 a) Derive continuity equation for current for transient state condition. **10**

Q 4 b) In cartesian co-ordinate a potential is a function of x only. At x= -1 cm V=25 V and $\overline{E} = -1x10^3\overline{a_x}$ V/m throughout the region. Find potential function V at x which is in between two plates **10**

Q 5 a) Find electric flux density $\overline{D}$ ,magnetic flux density $\overline{B}$ and magnetic field intensity $\overline{H}$ in free space, given that $\overline{E} = E_m\sin(377t - \beta z)\overline{a_y}$ . **10**

Q 5 b) i. Derive the modified form of Ampere's circuital law from conventional Ampere's circuital law **10**

ii. Write a note on surface voltage gradient on conductor or an electrode

Q 6 a) Derive of the electromagnetic wave equation from Maxwell's equation in phasor form for any medium. **10**

Q 6 b) Derive Gauss laws in the point form for an electric field and magnetic field. **10**

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