



CBCS SCHEME

18EC55

Fifth Semester B.E. Degree Examination, July/August 2022 Electromagnetic Waves

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Convert points P(1, 3, 5) from Cartesian to cylindrical and spherical coordinates. Also write the equation for differential surface and differential volume for cylindrical and spherical system. (08 Marks)
- b. A line charge of 2 nC/m lies along y-axis while surface charge densities of 0.1 and -0.1 nC/m^2 exist on the plane $x = 3$ and $x = -4$ respectively. Find the electric field intensity at a point (1, -7, 2). (06 Marks)
- c. A point charge of 50 nC each are located at A(1, 0, 0), B(-1, 0, 0), C(0, 1, 0) and D(0, -1, 0) in free space. Find the total force on the charge at A. (06 Marks)

OR

- 2 a. Compute the value of \vec{E} at P(1, 1, 1) caused by four identical 3nC charges located at $P_1(1, 1, 0)$, $P_2(-1, 1, 0)$, $P_3(-1, -1, 0)$ and $P_4(1, -1, 0)$. (08 Marks)
- b. Define electric field intensity and flux density. Derive the expression for electric field intensity due to several point charges. (06 Marks)
- c. Calculate the total charge for the defined volume. Given that $0.1 \leq |x|$, $|y|$, $|z| \leq 0.2$

$$\rho_v = \frac{1}{x^2 y^2 z^2}$$
 (06 Marks)

Module-2

- 3 a. Evaluate both sides of divergence theorem for the defined plane in which $1 \leq x \leq 2$, $2 \leq y \leq 3$, $3 \leq z \leq 4$. $\vec{D} = 4xz\vec{a}_x + 3y^2\vec{a}_y + 2xz\vec{a}_z \text{ C/m}^2$. (10 Marks)
- b. Determine workdone in carrying a charge of -2C from (2, 1, -1) to (8, 2, -1) in the electric field $\vec{E} = y\vec{a}_x + x\vec{a}_y \text{ V/m}$ (in Cartesian system). (05 Marks)
- c. Considering the path along the parabola $x = 2y^2$, obtain the equation of continuity in integral and differential form. (05 Marks)

OR

- 4 a. Let $V = \frac{\cos 2\theta}{r}$ in the free space in cylindrical system:
 - (i) Find \vec{E} at B(2, 30° , 1). (08 Marks)
 - (ii) Find the volume charge density at point A(0.5, 60° , 1). (06 Marks)
- b. Calculate the numerical value for $\text{div } \vec{D}$ at the point P(2, 3, -1) for $\vec{D} = (2xyz - y^2)\vec{a}_x + (x^2z - 2xy)\vec{a}_y + x^2y\vec{a}_z \text{ C/m}^2$. (06 Marks)
- c. Define potential-difference. Derive the expression for potential due to several point charges. (06 Marks)

Vtu 5th Sem Question Papers

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