

Enroll No

Q.P. Code
UT 2940

**Course Code: EC3034**

**Course Name: Electromagnetic Waves and Antenna Theory**

Day & Date: Monday, 11/08/2025

Time: 2:30 pm to 3:30 pm

Max Marks- 25

- Instructions:**
- 1) All questions are compulsory.
  - 2) Figures in rounded ( ) brackets within the question, indicate the scheme of marking for respective part of the question, whereas, figures in the first right column indicate total marks for that whole question.
  - 3) CO is the index number of the Course Outcome statement.
  - 4) The Bloom's taxonomy level (BL) for 1,2,3,4,5 and 6 is remember, understand, apply, analyze, evaluate and create respectively.
  - 5) Assume suitable data if necessary.
  - 6) Use of non-programmable calculators is allowed

Q.1 Answer the following

- |   | Marks | BT Level | COs |
|---|-------|----------|-----|
| A Transform the coordinates in Cartesian system into spherical and cylindrical coordinates.   | 7     | BL3      | CO1 |
| B Vectors are given as $A = 20a_x - 40a_y - 30a_z$ and $B = 15a_x + 20a_y - 25a_z$ . (i) Find the vector component of A parallel to B. (ii) Find the dot product between A and B (iii) Find the cross product between A and B. (iv) Find the angle between A and B. | 6     | BL3      | CO1 |

**OR**

- |   |   |     |     |
|---|---|-----|-----|
| B i) Find the gradient of a scalar field $V = 3x^3yz - 10xyz^2$ at point (4, 2, 6).   | 3 | BL3 | CO1 |
| ii) Find the divergence of a vector field $A = 5\rho \sin\phi a_\rho + 8z \cos\phi a_\phi - 10z^2 a_z$ at point $(5, \frac{\pi}{3} \text{ rad}, 8)$ . | 3 |     |     |

Q.2

Answer the following

- |   |   |     |     |
|---|---|-----|-----|
| A A charge $Q_A = -150 \mu C$ is located at A(3, 5, 8) meter and a charge $Q_B = 100 \mu C$ is at B(-3, 1, 4) meter in free space. Calculate the vector force exerted on $Q_B$ by $Q_A$ . | 6 | BL3 | CO2 |
|---|---|-----|-----|

- |                                |   |     |     |
|--------------------------------|---|-----|-----|
| B State and prove Gauss's law. | 6 | BL4 | CO2 |
|--------------------------------|---|-----|-----|

**OR**

- |  |   |     |     |
|--|---|-----|-----|
| B Derive the expression of electric field intensity due to uniformly distributed line charge along the entire z-axis and comment on nature E field with respect to charge. | 6 | BL5 | CO2 |
|--|---|-----|-----|

