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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

SUMMER SEMESTER EXAMINATION – JUNE 2018

B.Tech [ECE], V Semester

COURSE CODE: 10B11EC513 MAX. MARKS: 50

COURSE NAME: ELECTROMAGNETIC ENGINEERING

COURSE CREDITS: 04 MAX. TIME: 2 Hours

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

Q1. **(a)** Find the Curl of given vector $\bar{A} = 2xy\,\hat{a}_x + x^2z\,\hat{a}_y - z^3\,\hat{a}_z$. **[2]**

(b) Prove that vector field $\bar{P} = yz\,\hat{a}_x + xz\,\hat{a}_y + xy\,\hat{a}_z$ is solenoidal. **[2]**

(c) Express given vector in Cartesian coordinates $\bar{A} = r^2\,\hat{a}_r + \sin(\theta)\,\hat{a}_\phi$. **[2]**

(d) State Stoke's theorem. **[2]**

(e) What is the physical significance of Divergence? **[2]**

Q2. **(a)** A point in spherical coordinate is at $(5, 60^0, 150^0)$. Express its position in **[4]**

i. Cartesian coordinate

ii. Cylindrical coordinate

(b) Two point charges $3nC$ and $9nC$ are spaced by $1.1m$ apart. Determine the electric field at point P situated at a distance of $0.5m$ from each of the charges. **[4]**

(c) State Gauss's law. What are the applications of this law. **[4]**

(d) Write all four Maxwell's equations for static EM field. **[4]**

(e) The electric flux density is given as $\bar{D} = 20xy\,\hat{a}_x + (6xz^2 + 6yz)\,\hat{a}_y + (6x^2y + 3y^2)\,\hat{a}_z$, find volume charge density. **[4]**

Q3. **(a)** State Divergence theorem and verify this theorem for a vector field $\bar{A} = 3x\,\hat{a}_x + (2x + z)\,\hat{a}_y + (3z - x)\,\hat{a}_z$ in the region bounded by the cylinder $x^2 + y^2 = 9$ and the planes $x = 0, y = 0, z = 0$ and $z = 2$. **[7]**

(b) Sate Coulomb's law. Drive an expression for electric field intensity due to infinite long line charge density ρ_L. **[6]**

(c) State Ampere's circulation law. A thin ring of radius $5cm$ is located on plan $z = 1cm$ so that its center is at (0,0,1). If the ring carries $50mA$ current along $\hat{a}_\phi$, find $\bar{H}$ at $(0,0,-1)$. **[7]**