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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST 1 EXAMINATION - FEBRUARY 2018

B.Tech IV Semester (ECE)

COURSE CODE: 17B11EC411 MAX. MARKS: 15

COURSE NAME: Electromagnetic Engineering

COURSE CREDITS: 04 MAX. TIME: 1.0 HRS

Note: *Carrying of mobile phone during examinations will be treated as case of unfair means. Assume any missing data. Marks are indicated in parenthesis.*

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1. Let the electric flux density $\boldsymbol{D} = 5z^2 a_\rho + \rho \cos\varphi \, a_\varphi + 10\rho z a_z \, nC/m^2$. Use two different methods to find the amount of charge lying in the closed surface bounded by $1 < \rho < 2$, $\pi < \varphi < 2\pi$ and $0 < z < 1$. (6 marks)

2. Within the cylinder $\rho = 2$, $0 < z < 1$, the potential is given by $V = 100 + 50\rho + 150\rho \sin\varphi$ volts. Find the amount of work done in moving a positive charge of magnitude $20nC$ from the point $P(\rho = 3, \varphi = 0, z = -1)$ to the point $Q(\rho = 1, \varphi = \frac{\pi}{4}, z = 1)$. (3 marks)

3. An infinite line charge density of $\rho_l C/m$ is lying along the x-axis. A circular patch with inner radius $\rho = a$ and with outer radius $\rho = b$ is having a surface charge desnity of $\rho_s C/m^2$ on $z = 1$ plane. Write the expression (do not solve) for finding the electric filed intensity at the point $P(0,0,h)$. Use the symmetry to specify the direction of overall electric filed intensity at P. (3 marks)

4. Let $\boldsymbol{J} = \frac{400\sin\theta}{r^2+4} a_r \, A/m^2$. Find the total amount of current flowing through the portion of the spherical surface $r = 0.8m$ bounded by $0.1\pi < \theta < 0.3\pi$ and $0 < \varphi < 2\pi$. (3 marks)