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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST 2 EXAMINATIONS - OCTOBER 2016

B.Tech V Semester (ECE)

COURSE CODE: 10B11EC513 MAX. MARKS: 25

COURSE NAME: Electromagnetic Engineering.

COURSE CREDITS: 03 MAX. TIME: 1.5HRS

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

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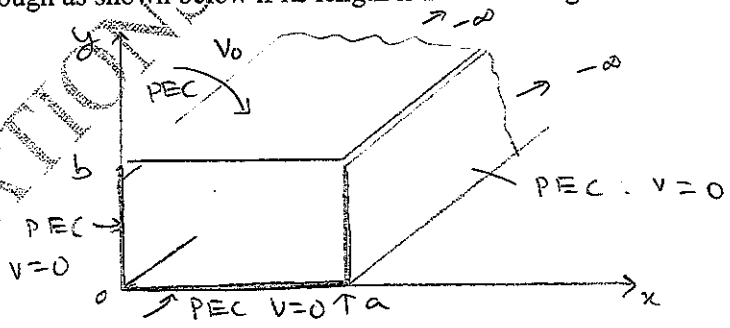
1. The magnetic field intensity in a certain region of free-space is given as $\boldsymbol{H} = \frac{x+2y}{z^2}a_y + \frac{2}{z}a_z A/m$. Use $\boldsymbol{J}$ to find the total current passing through the surface $z = 4$, $1 \leq x \leq 2$ and $3 \leq y \leq 5$. Verify this calculation using the Stoke's theorem. (5m)
2. Give a possible configuration with the circular current carrying metal loops to produce a magnetic field intensity of $a_x + 2a_y A/m$ at the origin. Draw the configuration clearly. (3m)
3. Find the potential inside a rectangular trough as shown below if its length is infinite along the z-direction.(5m)



4. Find the capacitance per unit area of two infinite cones $\theta_1 = \pi/4$ and $\theta_2 = 3\pi/4$.(Isolation has been provided somehow at the origin.). Plot the variation of electric filed intensity in order to see the field variations as a function of θ and r radial distance. (4m)
5. Let the region $z < 0$ composed of uniform dielectric material for which $\epsilon_r = 3.2$ while the region $z > 0$ is characterized by $\epsilon_r = 2$. Let $\boldsymbol{D_1} = -30a_x + 50a_y + 70a_z nC/m^2$ in region $z < 0$. Then find the electric flux density in region $z > 0$. (3m)
6. Write precisely about the following. (5m)
   a. Maxwell's equations in point form and integral forms. (2m)
   b. Conservative field. (1m)
   c. Differences between scalar electric potential and magnetic scalar potential. (1m)
   d. Method of images. (1m)