

## JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST 2 EXAMINATIONS - APRIL 2018

B.Tech IV Semester

COURSE CODE: 17B11EC411

MAX. MARKS: 25

COURSE NAME: Electromagnetic Engineering

COURSE CREDITS: 3

MAX. TIME: 90 Minutes

---

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

---

1. Write the Maxwell's equation for time varying fields in the integral form and point form along with the equation of continuity. (5m)
2. If  $\mathbf{H} = 15r a_\phi A/m$  in free space, use  $\mathbf{J}$  (volume current density) to find the total amount of current passing through the surface  $r = 5$ ,  $0 \leq \theta \leq 25^\circ$  and  $0 \leq \phi \leq 2\pi$ . Use the line integral as well to verify this total current. (5m)
3. Use the Laplace equation in order to find the electric field distribution between two concentric cylinders(PEC) with inner radius  $\rho = a$  and outer radius  $\rho = b$  units, if the medium with  $\epsilon_r = 1/(A + B\rho^2)$  (where A and B are constants) filled between the concentric cylinders. Find the capacitance of this structure as well. (5m)
4. The interface between two magnetic media is given by  $y + z = 1$ . Medium-1 ( $\mu_{r1} = 10$ ) is present for  $y + z > 1$  while medium-2 ( $\mu_{r2} = 20$ ) is present for  $y + z < 1$ . If there is a uniform sheet current density of  $10a_x mA/m$  exists on the interface, find  $\mathbf{H}_2$  if  $\mathbf{H}_1 = 2a_x + 3a_y + 4a_z mA/m$ . (5m)
5. Write briefly about the following.
  - a. Vector magnetic potential and scalar magnetic potential. (2m)
  - b. Principle to convert electrical energy to mechanical energy and mechanical energy to electrical energy. (2m)
  - c. Properties of perfect electrical conductor. (1m)