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Total No. of Printed Pages: [01]

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B. Tech. (EE), Semester – 5th
ELECTROMAGNETIC WAVES
Subject Code: BELED1-513
Paper ID: [18111526]

Time: 03 Hours

Maximum Marks: 60

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A

(2 marks each)

Q1. Attempt the following:

- a. Why Smith chart is used in transmission line?
- b. State the basic law of electromagnetic.
- c. How can you calculate phase velocity of wave?
- d. What is the concept of total internal reflection?
- e. Explain TE and TM mode of waveguide.
- f. Define Electric Field intensity.
- g. Write down expression for equation of current continuity.
- h. State the Stokes theorem.
- i. Explain the concept of scalar and vector magnetic potential.
- j. What is the concept of Brewster's angle?

Section – B

(5 marks each)

- Q2. Point charges of 60nC each are located at A(0,0,1) B(-1,0,1) C(1,0,1) and D(-1,1,0) in free space. Find the total force on the charge at B.
- Q3. Derive the expressions for Poisson's and Laplace's equations.
- Q4. Derive the expression for the magnetic force between two differential current elements
- Q5. Find $|E|$ at P (3, 1, 2) for the field of two co-axial conducting cylinders $V=50$ V at $\rho=2$ m and $V=20$ V at $\rho=3$ m.
- Q6. State and explain Faraday's law in point form and integral form.

Section – C

(10 marks each)

- Q7. Derive Lorentz force equation and derive the expression for the force on a differential current element placed in a magnetic field.
- Q8. The depth of penetration in a conducting medium is 0.1 m and the frequency of the electromagnetic wave is 1MHz. Find the conductivity of the conducting medium.
- Q9. A co-axial cable with radius of inner conductor a , inner radius of outer conductor b and outer radius c carries a current I at inner conductor and $-I$ in outer conductor. Determine and sketch variations of $\vec{H}$ against r for (i) $r < a$ (ii) $a < r < b$ (iii) $b < r < c$ (iv) $r > c$