**Roll No……..** **Total No. of Printed Pages: [01]**
**Total No. of Questions: [09]**

**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 ρ=2 m and V=20 V at ρ =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