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Total No. of Printed Pages: 1

Total No. of Questions: [09]

B. Tech ECE (Semester – 4th)
ELECTROMAGNETIC THEORY & APPLICATIONS
Subject Code: BECES1403
Paper ID: [18111317]

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. Define vector subtraction. If $A = 4a_x + 5a_y + 6a_z$ and $B = a_x + 2a_y + a_z$, find $A - B$.
- b. Write the purpose of the del operator (∇) in vector calculus.
- c. What is the physical significance of divergence?
- d. State Ampere's circuital law and its significance.
- e. Define Biot-Savart law and write its applications in calculating magnetic fields.
- f. State Faraday's law of electromagnetic induction.
- g. What is the difference between lossless and lossy media?
- h. Define the Poynting vector.
- i. List out the primary parameters of a transmission line.
- j. What is the purpose of the Smith chart in transmission line analysis?

Section – B

(5 marks each)

- Q2. Analyze the Divergence theorem using suitable mathematical expression and its applications in physical problems.
- Q3. Explain Poisson's and Laplace's equations in electrostatics.
- Q4. Discuss the differential form of Maxwell's equations and their physical significance.
- Q5. Describe the applications of electromagnetic waves in radar systems and microwave heating along with their practical significance.
- Q6. Derive the general transmission line equations and discuss their importance in transmission line theory.

Section – C

(10 marks each)

- Q7. a) Discuss the role of null identities in simplifying vector calculus expressions.
b) Explain Helmholtz's equation and describe its importance in wave theory and electromagnetics.
- Q8. a) Compare and contrast the various impedance matching techniques.
b) A low loss transmission line of 100Ω characteristic impedance is connected to a load of 300Ω . Calculate reflection coefficient and voltage standing wave ratio.
- Q9. a) Describe Gauss's law in electrostatics and its applications in spherical symmetry.
b) Derive the wave equation for electromagnetic waves and discuss the implications for wave propagation in different media.