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**B.TECH. IV SEM MAIN EXAM AUGUST-2023**  
**ELECTRONICS AND COMMUNICATION**  
**ENGINEERING**  
**(4EC4-04) ELECTROMAGNETIC**  
**FIELD THEORY**

Time : 3 Hours]

[Max. Marks : 70

[Min. Passing Marks :

**Instructions to Candidates :** Part – A : Short answer type questions (up to 25 words)

10 × 2 marks = 20 marks. All ten questions are compulsory.

Part – B: Analytical/Problem Solving questions 5 × 4 marks = 20 marks. Candidates have to answer 5 questions out of 7.

Part – C: Descriptive/Analytical/Problem Solving questions 3 × 10 marks = 30 marks. Candidates have to answer 3 questions out of 5.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting materials is permitted during examination. (Mentioned in form No. 205)

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2 \_\_\_\_\_

**PART A**

Q. 1. Does isolated magnetic exists, if know why ?

Q. 2. Write first Maxwell's equation.

Q. 3. What is vector magnetic potential.

Q. 4. Define skin effect.

Q. 5. What do you mean by SWR.

Q. 6. Write Ampere's Circuital law.

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- Q. 7. Define boundary conditions of EM waves.
- Q. 8. What do you mean by poynting vector ?
- Q. 9. State Biot-savart's Law.
- Q. 10. Define TE, TM and TEM waves.

### PART B

- Q. 1. Derive expression of energy density of static and magnetic field.
- Q. 2. Express the integral form of Maxwell's equation for :
- (a) Time varying field in perfect dielectric medium
- (b) Time varying field in perfect conducting medium.
- Q. 3. Derive coulomb's Law.
- Q. 4. Differentiate between refraction and reflection in dielectric surface of transmission lines
- Q. 5. A distortion less line has  $Z_0 = 60 \Omega$ ,  $\alpha = 20 \text{ mNp/m}$ ,  $\mu = 0.6c$ , where  $c$  is the speed of light in a vacuum. Find R, L, G, C and  $\lambda$  at 100MHz.
- Q. 6. Write applications of Laplace and poisson's equations.
- Q. 7. Derive expressions for E and H for rectangular waveguide.

### PART C

- Q. 1. In a lossless dielectric for which  $\eta = 60\pi$ ,  $\mu_r = 1$ , and  $H = -0.1 \cos(\omega t - z) a_x - 0.5 \cos(\omega t - z) a_y \text{ A/m}$ , calculate  $\epsilon_r$ ,  $\omega$  and E.
- Q. 2. Derive displacement using maxwell's equations
- Q. 3. Write the general instantaneous field expressions for TM and TE modes in waveguides. Deduce those for  $TE_{12}$  and  $TM_{12}$  modes.
- Q. 4. In a non-magnetic medium  $E = 4 \sin(2\pi \times 10^7 - 0.8x) a_z \text{ V/m}$ . Find  $\epsilon_r$ ,  $n$  ?
- Q. 5. Write analogy between electric and magnetic circuits.

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