

01/07/2016

4E4133

Roll No. _____

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4E4133

B.Tech. IV-Sem (Main & Back) Exam; June-July 2016
Electronics & Communication
4EC4A Electromagnetic Field Theory

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks (Main & Back): 26

Min. Passing Marks (Old Back): 24

Instructions to Candidates:-

Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. NIL

2. NIL

UNIT-I

Q.1 (a) State the gradient, divergence and curl theorems along with their implications. [8]

(b) Check the Stoke's theorem for the function $\vec{F} = x y \hat{x} + 2yz \hat{y} + 3z x \hat{z}$ using a triangular area whose corners are located at (0, 0, 0), (0, 2, 0) and (0, 0, 2) [8]

OR

Q.1 (a) State the Stoke's and Green's theorems. [8]

(b) Check the divergence theorem for the function $\vec{F} = x y \hat{x} + 2yz \hat{y} + 3z x \hat{z}$ by considering the volume of a cube with sides of lengths 2 located with its sides on positive axes and one corner over the origin. [8]

UNIT-II

- Q.2 (a) Derive the expression for the field intensity due to a circular sheet charge and then extend it to find the field due to an infinite plane sheet charge. [8]
- (b) State and explain the Gauss law. Applying the Gauss law, find out the field intensity due to an infinite plane sheet charge. [8]

OR

- Q.2 (a) Derive an expression for energy stored in a line charge distribution and extend it to the surface and volume charge distribution. [8]
- (b) A parallel plate capacitor of length ' ℓ ' with area ' a ' is inserted with a dielectric up to a distance $\ell - x$. Find the electric force on the dielectric slab. [8]

UNIT-III

- Q.3 (a) State and explain the Biot – savart law and derive the expression for magnetic field intensity due to surface and volume currents. [8]
- (b) Find the self inductance of a long coaxial cable of length ' ℓ ' with inner cylinder radius ' a ' and outer cylinder radius ' b ' carrying current I . [8]

OR

- Q.3 (a) State and explain the Amper's force law for current elements and loops. Does this law obey the Newton's third law? [8]
- (b) Find the magnetic field intensity at the centre of a square loop conductor of side L carrying a current of I amps. [8]

UNIT-IV

- Q.4 (a) What is the significance of the Maxwell's equations? Mention them in their various forms. [8]
- (b) What is the continuity equation? Derive it from the basics and describe all its forms. [8]

OR

- Q.4 (a) What is uniform plane waves? Show that the field in the uniform plane wave is independent of two dimensions. [8]
- (b) A plane wave with $E = 2.0 \text{ v/m}$ and a frequency of 300MHz is moving in free space impinging on a thick copper sheet ($\sigma = 5.8 \times 10^7$) located perpendicular to the direction of the propagation. Find the depth of penetration. [8]

UNIT-V

- Q.5 (a) Explain the retarded potentials and their concepts of radiation. [8]
- (b) Describe the radiation from a small current element and concept of radiation resistance. [8]

OR

- Q.5 (a) Describe the methods of eliminating interference. [8]
- (b) What are the EMI standards and explain the method of EMI testing. [8]
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