Roll No. _____

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B. Tech. III - Sem. (Main) Exam., February - 2021
Electrical Engineering
3EE4-08 Electromagnetic Field
Common for EE/EEE

Time: 2 Hours

Maximum Marks: 80

Instructions to Candidates:

Part – A: Short answer questions (up to 25 words) 5 × 2 marks = 10 marks. All five questions are compulsory.

Part – B: Analytical/Problem Solving questions (up to 100 words) 4 × 10 marks = 40 marks. Candidates have to answer four questions out of six.

Part – C: Descriptive/Analytical/Problem Solving questions 2 × 15 marks = 30 marks. Candidates have to answer two questions out of three.

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)

1. NIL _____

2. NIL _____

PART - A

Q.1 Give the statement of Gauss's Law. [2]

Q.2 What is Skin effect? [2]

Q.3 Give the statement of Biot – Savart Law. [2]

Q.4 What is Faraday's law for electromagnetic induction? [2]

Q.5 If $\vec{A} = 2 \times y\hat{a}_x + z\hat{a}_y + yz^2\hat{a}_z$, then find $\nabla.\vec{A}$ at P (2, - 1, 3). [2]

PART – B

Q.1 The Cartesian coordinates of certain point is P (2, 1, 3). Determine the corresponding –

   (a) Cylindrical   [5]

   (b) Spherical coordinate of this point   [5]

Q.2 Do the fields $\vec{E} = E_m \sin x \sin t \, \hat{a}_y$ and $\vec{H} = \frac{E_m}{\mu_0} \cos x \cos t \, \hat{a}_z$, satisfy Maxwell's equation?

                                                            [10]

Q.3 Derive the Poisson's equation and Laplace's equation.   [5+5=10]

Q.4 Find out the force between differential current elements.   [10]

Q.5 A parallel plate capacitor with plane area of 5 cm^2 and separation of 3 mm has a voltage 50 sin 10^{3}t volt applied to its plates. Calculates the displacement current assuming $\varepsilon = 2\varepsilon_0$.   [10]

Q.6 Determine the skin depth of copper at a frequency of 100 MHz. Also find out wave velocity. Where $\sigma = 58$ MS /m and $\mu = \mu_0 = 4\pi \times 10^{-7}$ H/m.   [5+5=10]

PART – C

Q.1 Derive the Maxwell's equation in point and integral form.   [15]

Q.2 (a) Define Poynting Vector.   [3]

    (b) Write the statement of Poynting theorem and derive it.   [2+10=12]

Q.3 State and explain the Magnetic Boundary conditions.   [3+12=15]