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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E.

ES Cluster (EEE/TCE/ECE/EIE/MD)

Course Code: 19ES3GCFTH

Course: FIELD THEORY

Semester: III

Duration: 3 hrs.

Max Marks: 100

Date: 15.09.2023

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
Revealing of identification, appeal to evaluator will be treated as malpractice.

UNIT - I

1	a) Develop an expression for $\text{EFI}(\bar{E})$ due to various charge distribution	06
	b) Develop and Analyses an expression for the Electric field intensity due to infinite long Straight Conductor.	06
	c) Analyses and Evaluate both sides of the divergence theorem precisely for the region: <i>if the flux density</i> $\bar{D} = x^2 \bar{a}_x + y^2 \bar{a}_y + z^3 \bar{a}_z; 0 < x < 2m, 0 < y < 2m, 0 < z < 4m$.	08

UNIT - II

2	a) Estimate and analyses the work done in carrying a -2C charge from $P_1(2, 1, -1)$ to $P_2(8, 2, -1)$ in field $E = y a_x + x a_y$ V/m i . Along parabola $x=2y^2$; 2). along the straight line joining P_1 & P_2 .	06
	b) Develop an expression for relation between Electric field intensity (E) & Scalar potential(V).	06
	c) Develop and analyses an expression for boundary conditions between conductor and free space.	08

OR

3	a) Develop an expression for the relation between Current density and volume charge density (04M) and continuity equation(04M).	08
	b) List out properties of conductors	04
	c) Develop and analyses an expression for boundary conditions between conductor and dielectric's space.	08

UNIT - III

4	a) Analyses and develop an expression for Laplace and Poisson's Equations & also Verify whether Laplace equations satisfied or not: 1). $V = x^2 - y^2 + z^2$; 2). $V = r \cos\theta + z$; 3). $r \cos\theta + \phi$	10
	b) Write Laplace's equation in spherical co-ordinates. Using this equation evaluate and analyses an expression for potential difference between concentric spherical shells. Also find the capacitance of the same.	10

UNIT - IV

5 a) Develop and Analyses an expression for the magnetic field intensity due to infinite long straight Conductor. **07**

b) If $\bar{H} = 10 \sin\theta \bar{a}_\phi A/m$, Analyses and Evaluate both sides of the Stokes' theorem for the surface $r = 3$, $0 \leq \theta \leq 90^\circ$, $0 \leq \phi \leq 90^\circ$. Let the surface have the \bar{a}_r direction. **07**

c) Analyses and develop an expression for Magnetic boundary conditions between permeability's of two medium. **06**

UNIT - V

6 a) State and explain faraday's law and Write Maxwell's equations in point form and integral for time varying field in free space. **10**

b) Analyze and develop an expression for electromagnetic waves in free space. **10**

OR

7 a) Analyze and develop an expression for uniform plane wave in good conductor
b) State and explain Poynting theorem and Let $\mu = 3 \times 10^{-5} \text{ H/m}$, $\epsilon = 1.2 \times 10^{-10} \text{ F/m}$, and $\sigma = 0$ everywhere. If $\mathbf{H} = 2 \cos(10^{10}t - \beta x)\mathbf{a}_z \text{ A/m}$, use Maxwell's equations to obtain expressions for \mathbf{B} , \mathbf{D} , \mathbf{E} , and β **10**
