U.S.N.										

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

Autonomous Institute Affiliated to VTU

May 2023 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: Electrical and Electronics Engineering **Duration: 3 hrs.**
Course Code: 22EE3PCFTH **Max Marks: 100**
Course: FIELD THEORY **Date: 08.05.2023**

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.

B.M.S.C.E. ODD SEM 2022-23

UNIT - I

1 a) Develop and analyze an expression for Electric Flux Density due to various cha distribution **06**

b) Derive an expression for EFI($\overline{E}$) due to charged circular ring. **06**

c) $Given\ the\ field\ D = 6\rho sin\left(\frac{\emptyset}{2}\right)a_\rho + 1.5\rho\cos\left(\frac{\emptyset}{2}\right)a_\emptyset c/m^2$, evaluate both sides of divergence theorem for the region $\rho = 0$ & $\rho = 2$, $\emptyset = 0$ & $\emptyset = \pi$, z=0&z=5. **08**

UNIT - II

2 a) Analyses and develop an expression for boundary conditions between conductor and dielectric of the medium. **07**

b) Two perfectly-conducting cylindrical surfaces are located at $\rho = 5cm$. The total current passing radially outward through the medium between the cylinders is 3 A DC. Assume the cylinders are both of length 'l".
Evaluate the:
i) The voltage and resistance between the cylinders and Electric field intensity in the region between the cylinders, if a conducting martial having $\sigma = 0.05$ S/m, $3 < \rho < 5\ cm.$
ii) Show that integrating the power dissipated per unit volume over the volume gives the total dissipated power. **06**

c) A given potential field $\overline{V}$ = 50*xyz* V in free space: **a).** Evaluate and analyze the total energy stored with in cube 0< *x, y, z* < 2. **b).** What value would be obtained by assuming a uniform energy density equal to the value at the center of the cube?. **07**

OR

3 a) Analyses and develop an expression for boundary conditions between conductor and dielectric's space. **07**

b) A potential field in free space is expressed as V = 20/(xyz)V. **08**

i) Find the total energy stored within the cube 1 <x,y,z<2

ii) What value would be obtained by assuming a uniform energy density to the value at the center of the cube?

c) List out properties of dielectrics **05**

UNIT - III

4 a) Using Laplace equation find the expression for potential distribution in the space b/w two plates of a parallel plate capacitor also find the capacitance of the system Using Laplace equation find the expression for potential distribution in the space b/w two plates of a parallel plate capacitor also find the capacitance of the system **10**

b) Write Laplace equation in cylindrical co-ordinates using this equation find an expression for potential distribution in the angular space between 2 infinite long co-axial cylinder. **10**

UNIT - IV

5 a) Develop and Analyses an expression for the magnetic field intensity due to Straight Conductor of Finite Length. **07**

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

c) Explain the Lorentz force equation due to force on a moving point charge. **06**

UNIT - V

6 a) Write Maxwell's equations in point form and integral for time varying field in free space **05**

b) Consider the region defined by |x|,|y|&|z| and |z| <1: **07**
$let\ \varepsilon_R = 5, \mu_R = 4\ and\ \sigma = 0. if\ J_d = 20\cos(1.5 \times 10^8 t - bx)\ a_y \mu A/m^2$:
Evaluate:

i) D & E;

ii) Use the point form of Faraday's law and an integration with respect to time to find H &B;

iii) use $\boldsymbol{\nabla \times H = J_d + J_c\ evaluate\ J_d}$

c) Analyze and develop an expression for electromagnetic waves in free space. **08**

OR

7 a) Analyze and develop an expression for uniform plane wave in good conductor **10**

b) State and explain Poynting theorem and In phasor form, the electric field intensity of uniform plane wave in free space is expressed as $E_x = (40\text{-}j30)e^{-j20z}a_x V/m$ **10**
$Evaluate\ \boldsymbol{w; \beta, f, \lambda, H_s\ and\ H(z,t) at\ P(6,-1,0.07), t = 71ps}$

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