

Total No. of printed pages = 2

EE 181603

16/6/23

Roll No. of candidate

--	--	--	--	--	--	--	--	--	--

BINA CHOWDHURY CENTRAL LIBRARY
(GIMT & GIPS)
Azara, Hatkhowapara
Guwahati - 781017

2023

B.Tech. 6th Semester End-Term Examination

ELECTROMAGNETIC FIELD THEORY

New Regulation (W.e.f. 2017 - 18) & New Syllabus (W.e.f. 2018 - 19)

Full Marks - 70

Time - Three hours

The figures in the margin indicate full marks for the questions.

(Answer question No. 1 and any four from the rest)

1. Answer the following questions : (10)
 - (a) The Stokes theorem relates between Surface integral and _____ integral. (Line/Surface/volume)
 - (b) The relation between Electric Intensity E , voltage applied V and distance D between the plates of a parallel plate condenser is $E =$ _____.
 - (c) The displacement current density of a material with flux density of 17 Cost is _____
 - (d) Divergence of Vector quantity is always a _____ quantity. (Vector/Scalar/both)
 - (e) Magnetic Field intensity due to a solenoid of length 3 m having 10 turns and a current of 3A is _____.
 - (f) _____ is defined as the dipole moment per unit volume.
 - (g) For lossless transmission line, $R = G =$ _____.
 - (h) The nature of the field is said to be Solenoidal if _____ is zero.
 - (i) Line integral of Electric Field around a closed path is always _____.
 - (j) Expression for loss tangent is _____.
2.
 - (a) Define Del operator with its expression. State and derive the expression for Divergence theorem. (7)
 - (b) Find the nature of the following field $F = 5XY 1_y + 5ZX^2 1_z$. (5)
 - (c) Convert Point (3,6,2) into cylindrical Coordinate system. (3)

[Turn over

3. (a) Define Electric Field Intensity with its expression. What are different charge distribution? (3)
- (b) Find Electric Field intensity at an external Point "P" lying at a distance "d" from an infinite straight uniformly charged wire. (6)
- (c) Given $A = \frac{10P^3}{4} \hat{i}_P$ in Cylindrical co-ordinates verify Gauss's Theorem of divergence for the volume enclosed by $P = 2, Z = 0$ to 10. (6)
4. (a) What is absolute potential? Derive its expression. Find Electrostatic potential due to a point charge Q + problem is next page. (1 + 2 + 3 + 4)
- In the region of free space where $2 < r < 3, 0 < \theta < \pi, 0 < \phi < 2\pi$, let $E = \left(\frac{K}{r^2}\right) \hat{i}_r$. Find the positive value of 'K' so that the total energy stored is exactly 1 Joule.
- (b) Find Force on charge Q1 (20 μ C) due to charge Q2 (-300 μ C) where Q1 is at (0,1,2)m and Q2 at (2,0,0)m. (5)
5. (a) Derive modified Amperes Circuital law in differential form. (5)
- (b) Find Current Density which produces a magnetic field of $H = \text{Sin}X \hat{i}_y$ (5)
- (c) Write short notes on Magnetic Scalar potential and Vector Potential. (5)
6. (a) Derive the reflection and transmission coefficient of uniform plane wave by perfect dielectric at normal incidence. (5)
- (b) State and derive the expression for Poynting vector and the flow of power. (5)
- (c) The parallel plates in a capacitor have an area of $4 \times 10^{-4} \text{m}^2$ and are separated by 0.4 cm. A voltage of $10 \text{Sin } 10^3 t$ volts is applied to the capacitor. Find the displacement current when the dielectric material between the plates has a relative permittivity of. (5)
7. (a) Find Skin Depth at a frequency of 1.6MHz in aluminium where conductivity is 38.2 MS/m and $\mu_r = 1$. Also find the Propagation Constant and wave velocity. (5)
- (b) Derive the expression for wave equation in free space. (5)
- (c) In a lossless transmission line, the velocity of propagation is $2.5 \times 10^8 \text{ m/s}$. Capacitance of the line is 30 pF/m. Find (5)
- (i) Phase constant at 100 MHz
- (ii) Characteristic impedance of the line.