

Con. 5243-07.

[REVISED COURSE]

CD-5862

(3 Hours)

[Total Marks : 100]

- N.B. : (1) Question No. 1 is compulsory.
(2) Answer any four out of the remaining six question.
(3) Assume suitable data if necessary.
(4) Figures to right indicates full marks.

1. Attempt any four of the following :- 20
- State and explain the divergence theorem.
 - Explain the need for modification of Ampere's law for time varying fields.
 - Explain the concept of Electric scalar potential.
 - Explain Ampere's circuital law.
 - State the Maxwells equation for static fields.
2. (a) Derive an expression for the Electric field intensity due to an infinite line charge. 10
(b) A uniform line charge, $P_L = 25 \text{ nc/m}$ lies on the line $X = -3, Z = 4$ in free space. 10
Find \vec{E} in Cartesian components at the point $P(2, 15, 3)$.
3. (a) If $D = 4xy\vec{a}_x + 2(x^2 + z^2)\vec{a}_y + 4yz\vec{a}_z \text{ c/m}^2$. Evaluate surface integral to find the 10
total charge enclosed in the rectangular parallelopiped $0 < x < 2, 0 < y < 3,$
 $0 < z < 5 \text{ m}$.
- (b) If $\vec{E} = -8xy\vec{a}_x - 4x^2\vec{a}_y + \vec{a}_z \text{ v/m}$. Find the work done in carrying a 6 coulombs 10
charge from $A(1, 8, 5)$ to $B(2, 18, 6)$ along the path $y = 3x + 2, z = x + 4$.
4. (a) A potential function is $V = 2x + 4y$ volts in free space. Find the stored energy in free 10
space in the 1m^3 volume centered at the origin.
- (b) $V = 0$ volts for $r = 0.1\text{m}$ and $V + 100$ volts for $r = 2.0\text{m}$ in spherical co-ordinates. 10
Assuming free space between the concentric spherical shelts, find \vec{E} & \vec{D} using
Laplace's equation.
5. (a) Using Biot Savart law, find the magnetic field intensity due to an infinite long straight 10
filament placed along z -axis.
- (b) A square filamentary loop 2 meters in side is placed in $Z = 0$ plane with its center 10
at origin. If current of 10 A is passing through loop, find \vec{H} at origin.
6. (a) State and explain Maxwell's equation for free space in time varying fields. 10
(b) The circular loop conduction lies in the $z = 0$ plane, has a radius of 0.1m and resistance 10
of 5.0Ω . Given $\vec{B} = 0.20 \sin 10^3 t \vec{a}_z(\text{T})$, determine the current in the loop.
7. (a) For a electromagnetic wave prove that $\vec{E} \cdot \vec{H} = 0$ and $\vec{E} \times \vec{H}$ is having the direction 10
of propagation of wave.
- (b) Calculate the intinsic impedance η , the propagation constant γ , and the wave 10
velocity μ for a conducting medium in which $\sigma = 58 \text{ M s/m}, \mu_r = 1$, at a frequency
 $f = 100 \text{ MHz}$.