Total No. of Questions : 8]

SEAT No. : ____

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T.E. (E & TC)

ELECTROMAGNETICS

(2015 Pattern) (Semester - I)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answers Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) Derive an expression for electric field intensity $\bar{E}$ at a point ρ due to infinite line charge with uniform charge density ρ_L. **[6]**

b) State significance of poisson's and laplace's equations. Derive the expressions for the same **[6]**

c) In cylindrical co-ordinates a magnetic field is given by

$\bar{H} = (2\rho - \rho^2)\hat{a}_\phi$ A/m for $0 \leq \rho \leq 1$m.

i) Determine the current density as a function of ρ within the cylinder.

ii) Determine total current passing through surface Z = 0, $0 \leq \rho \leq 1$ in $\hat{a}_z$ direction. **[8]**

OR

Q2) a) If $\bar{D} = (2y^2 + z)\hat{a}_x + 4xy\hat{a}_g + x\hat{a}_z$ c/m^2. Find

i) Volume charge density at (–1, 0, 3)

ii) The flux through the cube defined by $0 \leq x \leq 1$, $0 \leq y \leq 1$, $0 \leq z \leq 1$.

iii) The total charge enclosed by the cube **[6]**

b) Derive an expression for capacitance of parallel plate capacitor. **[6]**

c) Derive boundary condition for the interface between two magnetic media of different permeabilities. **[8]**

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Q3) a) State poynting theorem. State significance of poynting vector. Derive an expression for time average poynting vector **[8]**

b) In free space $\bar{E} = 20.\ \cos(wt - 50x)\hat{a}_y$ v/m calculate

i) $\bar{J}d$ ii) $\bar{H}$ iii) w **[8]**

OR

Q4) a) State Maxwell's equations in point and integral form for **[8]**

i) Static electric and steady magnetic field.

ii) Time varging field.

b) State Faraday's law. Explain the terms transformer emf and motional emf. **[8]**

Q5) a) State primary and secondary constants of transmission line. Derive relationship between primary and secondary constants of transmission line **[8]**

b) The characteristic impedance of the uniform transmission line is 2040Ω at a frequency of 800 Hz. At this frequency the propagation constant is $0.054 \angle 87.9^\circ$. Determine R, L, G, C, V and λ. **[10]**

OR

Q6) a) What is meant by dissipationless line? Derive an expression for input impedance of dissipationless line. **[8]**

b) A lossless transmission line with $Z_O = 50\Omega$ is 30m long and operates at 2MHz. The line is terminated with a load $Z_L = 60 + j40\Omega$. If u = 0.6 C on the line, using Smith chart find

i) Reflection coefficient

ii) Standing wave ratio

iii) Input impedance

iv) Position of V_{max} & V_{min} form load **[10]**

Q7) a) What is meant by polarization of the wave. State its types and explain any one in detail **[8]**

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b) Explain the terms : **[8]**

i) Depth of penetration

. ii) Snell's law

OR

Q8) a) Explain how reflection of wave takes place by perfect conductor **[8]**

b) Calculate skin depth propagation constant and wave velocity *v* at a frequency of 1.6 MHz in Aluminium Where 6 = 32.8 Ms/m and $\mu_z = 1$. **[8]**

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