2019

B.Sc.

3rd Semester Examination

ELECTRONICS (Honours)

Paper - C 7-T

[Electromagnetic]

Full Marks : 40   Time : 2 Hours

The question are of equal value for any group/half. The figures in the margin indicate full Marks. Candidates are required to give their answers in their own words as far as parctiable. Illustrate the answers wherever necessary.

1. Answer any *five* questions :   5×2

   i) What are isotropic and anisotropic materials ?   2

   ii) What are electromotive force and magnetomotive force?   2

   iii) What are phase velocity and group velocity of wave propagating in a medium ?   2

   iv) Explain why a magnetic monopole can not exist in nature.   2

[Turn Over]

v) Deduce Coloumb's law from the Gauss law of electrostatics.　　2

vi) Derive Laplace's and Poisson's equations.　　2

vii) What is motional EMF ?　　2

viii) A rectangular wave guide have dimension of width a = 5cm and height b = 2 cm. Find cut off frequency for demiminant TE mode of propagation.

　　2

2. Answer any *four* questions :　　4×5

i) A volume charge density inside a hollow sphere is $p=10e^{-20r}C/m^3$. Find the total charge enclosed within the sphere. Also find the electric flux density on the surface of the sphere.　　2½+2½

ii) A long conducting cylinder of radius 'a' is placed along the z-axis. The cylinder carries a current density T_o r $\hat{z}$ A/m² for r < a. Find H inside and outside the conductor.　　2½+2½

iii) Deduce poynting theorem for the flow of electromagnetic energy in free space.　　5

iv) Deduce expressions for the energy density in electric field and magnetic field.　　2½+2½

v) Deduce an expression for the equation of continuity and show that Maxwell's equation satisfies the equation of continuity. $2\frac{1}{2}+2\frac{1}{2}$

vi) What are the losses involved in transmission of electromagnetic energy in a guiding structure. Find expression for "Loss tangent" (tan δ). $2+3$

3. Answer any *one* question : 1×10

(i) a) Write integral forms of Maxwell's equations.

b) Deduce an expression for the "Skin depth" of an electromagnetic wave propagating in conducting medium. $4+6$

(ii) a) Find expressions for cut-off frequency and phase velocity of wave propagating inside a rectangular wave guide in TE mode of propagation.

b)Why TEM mode can not exist inside a rectangular wave guide? $8+2$