2017

M.Sc.

3rd Semester Examination

ELECTRONICS

PAPER—ELC-301

Full Marks : 50

Time : 2 Hours

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

(Advance Electromagnetic Theory and Radiating Systems)

Answer Q. No. *1* and any *three* questions from the rest.

1. (a) Define VSWR. What is the value of VSWR of either short circuited or open circuited transmission line ?

(b) In a region $\vec{E}$ and $\vec{H}$ fields are given as

$$\vec{E} = 100(j\hat{x} + 2\hat{y} + j\hat{z})e^{j\omega t}$$

$$\vec{H} = (-\hat{x} + j\hat{y} + \hat{z})e^{j\omega t}$$

Find the average power flow density and direction of flow.

(c) Why TEM mode of propagation is not possible in a rectangular wave guide ?

(d) A loss less transmission line is terminated in a short circuit. What is the minimum length of the line such that the input impedance is capacitive ?

(e) Compare radiation pattern of an isotropic antenna with a $\lambda/2$ dipole antenna. 2×5

2. (a) Write down Maxwell's equation in their integnal form.

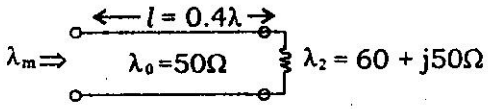
(b) An uniform plane wave propagating through a free space. Show that $\vec{E}$ and $\vec{H}$ field component satisfies the relation

$$\frac{E}{H} = \sqrt{\frac{\mu}{\epsilon}}$$

Also find the orientation between $\vec{E}$ and $\vec{H}$.

3. (a) Deduce Telegrapher's equation for the transmission line.

(b) Use the Smith Chart to find the following quantities for the transmission line c and t below.



(i) The SMR on the line ;

(ii) The reflection co-efficient at the load ;

(iii) The load admitance ;

(iv) The input impedance of the line ;

(v) The distance from the load to the first voltage minimum ;

(vi) The distance from the load to the first voltage maximum.

4. (a) Define directivity, radiations resistance and effective operative of an antenna.

(b) Find an expressed for the effective aperture of an antenna.

(c) A transmitting station of 25 kW power is radiating in free space. Find the field strength 30 km away.

3+5+2

5. (a) What are the different layers of ionsphere ?

(b) Explain each of following terms —

(i) virtual height ;

(ii) Skip distance ;

(iii) Maximum usable frequency in terms of ionsphere propagation.

(c) Derive an expression for plasma frequency in terms of maximum ionisation density. 3+3+4

6. (a) Find electric and magnetic field (E_γ, E_β $H_{0\phi}$) components which is radiated from a small current element (Hertz dipole).

(b) Explain Terms involving $\frac{1}{r}$, $\frac{1}{r^2}$ and $\frac{1}{r^3}$ there in.

(c) Predict the radiation pattern of the dipole in θ and ϕ plane. 5+3+2

(Internal Assessment : 10 Marks)

———