

Code No: RT22044

R13

SET - 1

II B. Tech II Semester Supplementary Examinations, November-2017
EM WAVES AND TRANSMISSION LINES
(Com to ECE, EIE)

Time: 3 hours

Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

PART -A

1. a) Define Linear, isotropic and homogeneous dielectrics. (4M)
- b) Write the equation for V_{emf} of moving loop in time varying field. (3M)
- c) Sketch the plots of $\mathbf{E}$ and $\mathbf{H}$ as a function of distance and time in free space. (4M)
- d) What is Brewster's angle? Explain. (4M)
- e) Draw the L – type equivalent circuit model of a two conductor transmission line. (3M)
- f) What is meant by stub? Explain. (4M)

PART -B

2. a) Derive Poisson's and Laplace equations from fundamentals. (8M)
- b) A hollow conducting cylinder has a inner radius 'a' and outer radius 'b' and carries a current 'I' along the positive z-direction. Find $\mathbf{H}$ everywhere. (8M)
3. a) State and explain Faraday's law of electromagnetic induction. (8M)
- b) A conducting circular loop of radius 20 cm lies in the $z = 0$ plane in a magnetic field $\mathbf{B} = 10 \cos 377t \mathbf{a}_z$ mWb/m². Calculate the induced voltage in the loop. (8M)
4. a) What are the properties of uniform plane wave? Show that for a uniform plane wave, the field components are zero in the direction of propagation of it. (8M)
- b) A uniform plane wave in air has $\mathbf{E} = 10 \cos(2\pi \times 10^6 t - \beta z) \mathbf{a}_y$ V/m. (8M)
 - (i) Calculate β and λ .
 - (ii) Sketch the wave at $z = 0, \lambda/4, \lambda/2$.
 - (iii) Find $\mathbf{H}$.
5. a) State and explain poynting theorem. (8M)
- b) In free space ($z \leq 0$), a plane wave with $\mathbf{H}_i = 10 \cos(10^8 t - \beta z) \mathbf{a}_x$ mA/m is incident normally on a lossless medium ($\epsilon = 2\epsilon_0, \mu = 8\mu_0$) in the region $z \geq 0$. Determine the reflected wave $\mathbf{H}_r, \mathbf{E}_r$ and the transmitted wave $\mathbf{H}_t, \mathbf{E}_t$. (8M)
6. a) Define the term characteristic impedance and derive the expression for it. (8M)
- b) Measurements on a lossy transmission line at 800 MHz indicate $Z_0 = 50 + j0 \Omega, \alpha = 0.01$ Np/m and $\beta = 4$ rad/m. determine the line parameters R, L, G and C. (8M)
7. a) Explain the construction of Smith Chart. (8M)
- b) A 50Ω coaxial cable feeds a $75 + j20 \Omega$ dipole antenna. Find reflection coefficient and standing wave ratio. (8M)