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**

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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 **E** and **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 **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/m^2. 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, λ/4, λ/2.
   (iii) Find **H**.

5. a) State and explain poynting theorem. (8M)
   b) In free space (z ≤ 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 ($\varepsilon = 2\varepsilon_0$, $\mu = 8\mu_0$) in the region z ≥ 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 $Z_0 = 50 + j0\ \Omega$, α = 0.01 Np/m and β = 4 rad/m. determine the line parameters R, L, G and C. (8M)

7. a) Explain the construction of Smith Chart. (8M)
   b) A 50 Ω coaxial cable feeds a 75 + j20 Ω dipole antenna. Find reflection coefficient and standing wave ratio. (8M)
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