Code No: RT22044 **R13** SET - 1

II B. Tech II Semester Supplementary Examinations, April-2018
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 magnetic torque and magnetic dipole moment. (4M)
   b) What is Faraday's law of electromagnetic induction? (3M)
   c) Define loss tangent and loss angle. Explain the significance of these terms. (4M)
   d) What is Poynting vector? What is the physical interpretation of this vector? (4M)
   e) Sketch **E** and **H** fields in coaxial transmission line. (3M)
   f) Explain how standing wave ratio is calculated using smith chart. (4M)

PART -B

2. a) What do you mean by electric dipole and derive the expression for electric field due to dipole with center at the origin. (8M)
   b) In free space, the magnetic flux density $\mathbf{B} = y^2\mathbf{a_x} + z^2\mathbf{a_y} + x^2\mathbf{a_z}$ Wb/m^2 (8M)
   i) Find the magnetic flux through $x = 1, 0 < y < 1, 1 < z < 4$.

3. a) Write down the integral and differential forms of Maxwell's equations and write their physical significance. (8M)
   b) A parallel plate capacitor with plate area of 5 cm^2 and plate separation of 3 mm has a voltage $50 \sin 10^3 t$ applied to its plates. Calculate the displacement current assuming $\varepsilon = 2\varepsilon_0$. (8M)

4. a) Explain about wave propagation in free space. (8M)
   b) An EM wave propagating in a certain medium is described by $\mathbf{E} = 25 \sin(2\pi \times 10^6 t - 6x)\mathbf{a_z}$ V/m (8M)
   (i) Determine the direction of wave propagation.
   (ii) Compute the period T, the wavelength λ and the velocity
   (iii) Sketch the wave at t = 0, T/8, T/4, T/2.

5. a) Discuss about reflection and refraction of plane waves for oblique incidence with **E** parallel to the plane of incidence. (8M)
   b) A plane wave travelling in free space is normally incident on the interface with a perfect dielectric with $\varepsilon_r = 3$. Compute the magnitudes of incident, reflected and transmitted E and H at the interface. Take $E_i = 1.5$ mV/m in medium 1. (8M)

6. a) Discuss about lossless and distortionless transmission lines. (8M)
   b) A transmission line operating at 500 MHz has $Z_0 = 80\ \Omega$, $\alpha = 0.04$ Np/m and $\beta =$ 1.5 rad/m. determine the line parameters R, L, G and C. (8M)

7. a) Explain about Single stub matching (8M)
   b) Explain load matching using quarter wave transformer. (8M)
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