# 306402

## May, 2019

## B. Tech (EIC) - 4th, SEMESTER
## ELECTROMAGNETIC WAVES (ECC-02)

Time : 3 Hours]

[Max. Marks : 75

*Instructions :*

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*

2. *Answer any four questions from Part-B in detail.*

3. *Different sub-parts of a question are to be attempted adjacent to each other.*

### PART–A

1. (a) Explain the importance of characteristic impedance in transmission line. (1.5)

   (b) What are the applications of smith chart? (1.5)

   (c) Define standing wave ratio in terms of reflection coefficient. (1.5)

   (d) Explain role of vector algebra in electromagnetics. (1.5)

   (e) Define uniform plane wave. (1.5)

(f) Describe the characteristics of uniform plane wave. (1.5)

(g) Explain the relation between group velocity and phase velocity. (1.5)

(h) Compare TE and TM mode in rectangular waveguide. (1.5)

(i) What is monopole and dipole antenna? (1.5)

(j) Explain the concept total internal reflection. (1.5)

## PART-B

2. (a) Explain transmission line as a distributed circuit. Draw the equivalent circuit of transmission line. (5)

(b) Discuss the general transmission line equation for the voltage and current at any point on a transmission line. (10)

3. (a) State and prove divergence theorem for a given differential volume element. (5)

(b) Show Maxwell's equation for static fields. Explain how they are modified for time varying electric and magnetic fields. (10)

4. (a) State and prove Poynting theorem. (8)

(b) Explain the general expressions of the attenuation and phase constant for conducting medium. (7)

5. (a) Describe the equations for a plane wave incident normally on a plane dielectric boundary. (8)

(b) An Air filled rectangular waveguide of dimension a = 4 cm, b = 2 cm transports energy in the dominant mode at a rate of 2 mW. If the frequency of operation is 10 GHz, determine the peak value of the electric field in the waveguide. (7)

6. (a) A standard air filled rectangular waveguide with dimension a = 8.636 cm, b = 4.318 cm is fed by a 4 GHz carrier from a coaxial cable. Determine whether a $TE_{10}$ mode will be propagated. If, so calculate the phase velocity and group velocity. (7)

(b) Explain the power transmission and power losses in rectangular waveguides. (8)

7. Explain the following :

(a) Hertizian Dipole.

(b) Antenna characteristics. (8+7)

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