53 (EC 501) ELMW

2014

ELECTROMAGNETIC WAVES

Paper : EC 501

Full Marks : 100

Pass Marks : 30

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* Starting from Maxwell's equation find the wave equation for an electromagnetic wave in free space. 10

(b) Derive the relationship between electric field and magnetic field of an uniform plane wave. 10

2. Explain the reflection of a uniform plane wave by a perfect dielectric under the following conditions

(i) Normal incidence

(ii) Oblique incidence. 20

3. Derive the components of electric field and magnetic field for a wave travelling between two parallel conducting plates in free space in transverse electromagnetic mode. 20

4. *(a)* What is polarization of a wave ? Explain the *three* types of polarization. 10

(b) Why TEM mode is impossible in waveguides ? 5

(c) How different modes in rectangular waveguide can be excited ? 5

5. Find the expression for various components of the electric field and magnetic field in a rectangular waveguide in transverse electric and transverse magnetic mode. 20

6. A wave is travelling through a circular waveguide in airfilled condition. The radius of the guide is $5cm$ and the guide contains an air dielectric. If the wave is travelling at a frequency $10GHz$ in TE_{11} and TM_{11} mode then find $(X_{np} = 1{\cdot}841$ for TE_{11} and $X_{np} = 3{\cdot}832$ for $TM_{11})$. 20

(a) Cut off frequency

(b) Wavelength

(c) Phase velocity

(d) Phase constant

(e) Wave impedance

7. Write short notes on : $10 \times 2 = 20$

(i) Semi circular cavity resonator

(ii) Coupling of a cavity resonator.
