Registration No. :

Total number of printed pages – 2

B. Tech

CPEC 5307 (Old)

Sixth Semester (Back) Examination – 2013
MICROWAVE ENGINEERING
BRANCH : EC, ETC
QUESTION CODE : B366
Full Marks – 70
Time : 3 Hours

Answer Question No. **1** which is compulsory and any **five** from the rest.
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

   (a) How do you differentiate TEM, TE and TM waves ? Why transmission line doesn't support TE and TM waves ?

   (b) What is significance of Q in resonator ? Is it necessary to characterize ?

   (c) Why circulators are made of ferrite ?

   (d) A lossless co-axial cable is used to delay a pulse by 100 ns. The inductance and capacitance of the cable are 0.20 μH/m and 60 pF/m respectively. Determine the length of cable ?

   (e) An air filled waveguide operates at a frequency of 10 GHz. If the dimensions of the waveguide are a = 2 cm, b = 1 cm, determine which mode of TE will propagate in the waveguide.

   (f) What is the significance of purely reactive wave impedance ?

   (g) What is difference between O type and M type tubes ? Give proper example.

   (h) What are the advantages of TWT ?

   (i) What is the roll of isolator in microwave generator ?

   (j) Why we are using horn antenna ? What is gain of horn antenna ?

2. (a) A rectangular wave guide with dimension of 3×2 cms operates in the TM_{11} mode at 10 GHz. Determine the characteristic wave impedance.   5

P.T.O.

(b) Derive the equations of a circular waveguide. Explain why Bessel functions of the second kind are not useful in the analysis of wave propagation in a hollow circular waveguide. 5

3. (a) Why a three port network can't be lossless, reciprocal and matched at all ports ? 5

(b) Explain the principle of operation of travelling wave tube as an amplifier. 5

4. With neat sketches discuss different types of horn antenna. Discuss the application of the horn and give its advantages. 10

5. (a) Explain the term 'fading'. Describe different types of fading of space wave signals. 5

(b) What do you mean by line of sight propagation ? Explain briefly. 5

6. (a) Define negative differential resistivity. Explain the J-E characteristic of a Gunn diode. 5

(b) With the help of a circuit diagram explain how the Gunn diode can be used as an amplifier and an oscillator. 5

7. (a) Briefly explain S matrix of directional coupler. How you can calculate coupling factor and directivity ? 4

(b) A 25 m long lossless transmission line is terminated with a load having an equivalent impedance of (40 + j30) Ω at 10 MHz. The inductance and capacitance of the line are 310.4 nH/m and 38.28 pF/m respectively. Calculate, (i) characteristic impedance, (ii) phase constant, (iii) input impedance at the sending end and (iv) input impedance at midpoint of line. 6

8. Write short notes on any **two** of the following : 5×2
(a) Stub matching
(b) Reflex klystron
(c) Linear mixer operation
(d) Gain and Bandwidth of Reflector Antenna.