

## **PHY–554**

### **Microwave Devices and Communication System**

M. Sc. Physics (MSCPHY–12/13/16)

Second Year Examination, 2017

**Time : 3 Hours**

**Max. Marks : 80**

**Note :** This paper is of **eight (80)** marks containing **three (03)** Sections A, B and C. Attempt the questions contained in these Sections according to the detailed instructions given therein.

#### **Section–A**

##### **(Long Answer Type Questions)**

**Note :** Section ‘A’ contains four (04) long answer type questions of nineteen (19) marks each. Learners are required to answer *two* (02) questions only.

1. Define circular wave guide and give its characteristics. Discuss the field pattern of TE (Transverse Electric) and TM (Transverse Magnetic) waves in circular wave.
2. What is S-matrix and derive expression for the S-matrix for a shunt tee.
3. What is Faraday’s rotation ? Describe the construction and working of four port circulator.
4. Explain the working of Magnetron Oscillator. Derive an expressions for Hull cut-off magnetic and cut-off voltage equations.

**Section-B****(Short Answer Type Questions)**

**Note :** Section 'B' contains eight (08) short answer type questions of eight (08) marks each. Learners are required to answer *four* (04) questions only.

1. State and prove antenna theorem.
2. Describe briefly balance modular for production of AM wave.
3. What is Radar ? Discuss the classification of Radars.
4. Briefly describe the tunnel diode.
5. The components of an envelope diode detector are  $R = 200 \text{ k}\Omega$  and  $C = 100 \text{ pF}$ . Determine the maximum percentage of modulation if diagonal clipping is to be avoided, i.e. for no distortion for an audio frequency of  $10 \text{ Kc/s}$ .
6. Discuss about the TRAPATT diode.
7. What are phase velocity and group velocity in wave guides ? Derive the expression for  $V_p$  and  $V_g$ .
8. Show that the TEM wave cannot exist in a single conductor waveguides.

**Section-C****(Objective Type Questions)**

**Note :** Section 'C' contains ten (10) objective type questions of one (01) mark each. All the questions of this Section are compulsory.

Fill in the blanks of the following :

1. Antenna lens will be highly dispersive when refractive index ( $n$ ) is .....

2. Ports separation of hybrid rings is ..... .
3. Tunnel diode is used for ..... .
4. Maximum efficiency of Klystron is ..... .
5. The working principle of continuous wave radar is based on..... .

Choose the correct alternative :

6. The biggest disadvantage of the IMPATT diode is its :
  - (a) lower efficiency than that of the other microwave diodes
  - (b) high noise
  - (c) inability to provide pulsed operation
  - (d) low power-handling ability
7. Modulation is a process of :
  - (a) reducing distortions
  - (b) improving thermal stability
  - (c) combining audio and radio frequency waves at the transmitter
  - (d) generating constant frequency range
8. When microwave signals flow through the curvature of the earth is called :
  - (a) Ionospheric scattering
  - (b) Raman scattering
  - (c) Duct position
  - (d) Faraday's effect
9. What is the cut-off frequency of a waveguide ?
  - (a) the lowest frequency the waveguide operates

- (b) the highest frequency the waveguide operates
  - (c) the same as the operating frequency
  - (d) the only frequency the waveguide operates
10. The isolators used in the transmission lines are capable of breaking :
- (a) No current
  - (b) Load current
  - (c) Fault current
  - (d) Charging current