S-0 Roll No. ……..

PHY–554

Microwave Devices and Communication System

M.Sc. PHYSICS (MSCPHY-12/13/16/17)

Second Year, Examination, 2018

Time : 3 Hours **Max. Marks : 80**

Note : This paper is of **eighty (80)** marks containing **three (03)** Sections A, B, 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. What are characteristics of rectangular wave guide ? Derive the field equation in a rectangular wave guide.
2. Discuss in needs of S-parameters and derive S-matrix of E-plane tee.
3. What is Travelling Wave Tube (TWT) ? Describe the principle of operation of TWT.
4. State and prove antenna theorem. Explain about effective length of antenna.

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. Explain the scattering matrix formulation.
2. Explain how tunnel diode works as microwave amplifier.
3. What is magnetron oscillator ? Derive expression for Hull cut-off magnetic and Hull cut off voltage equations.
4. Describe the method of amplitude-comparison monopulse target tracking Radar.
5. Discuss the phase velocity and group velocity in wave guides. Derive the expression for V_p and V_g.
6. Explain parametric up-convertor.
7. Explain the following :
   (a) Gain
   (b) Efficiency
   (c) Radiation resistance of an antenna
8. Draw circuit diagram for collector modulation and base modulation and also explain its working.

Section–C

(Objective Type Questions)

Note : Section 'C' contains ten (10) objective type questions of one (1) mark each. All the questions of this Section are compulsory.

1. When signal amplitude is equal to the amplitude of the carrier, the percentage modulation factor will be :
   (a) 25

(b) 50

(c) 100

(d) 200

2. A woofer should be fed from the input through a :

(a) low pass filter

(b) high pass filter

(c) band pass filter

(d) band stop filter

3. If output power of a radio receiver is doubled, its volume is increased by ..... dB.

(a) 2

(b) 3

(c) 1

(d) 4

4. Gyrator produces a phase shift of :

(a) 90°

(b) 180°

(c) 270°

(d) 360°

5. E-plane tee is also called :

(a) Shunt tee

(b) Hybrid tee

(c) Series tee

(d) H-parameters

6. For a given carrier wave, maximum undistorted power is transmitted when value of modulation is :

   (a) 1

   (b) 0.8

   (c) 0.5

   (d) 0

7. If the antenna diameter in a radar system is increased by a factor of 4, the maximum range will be increased by a factor of :

   (a) $\sqrt{2}$

   (b) 2

   (c) 4

   (d) 8

8. The biggest disadvantage of CW Doppler radar is that :

   (a) It does not give the target velocity

   (b) It does not give the target range

   (c) A transponder is required at the target

   (d) It does not give the target position

9. The biggest advantage of the TRAPATT diode over the IMPATT diode is its :

   (a) lower noise

   (b) higher efficiency

   (c) ability to operator at high frequency

   (d) lesser sensitivity to harmonics

10. Which of the following wave guides tuning components is not easily adjustable ?

    (a) Screw

    (b) Stub

    (c) Iris

    (d) Plunger