S-809 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 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. Discuss in needs of S-parameter and derive S-matrix of hybrid tee.
2. Deduce an expression for the induced electromotive force in a loop antenna. Discuss its application as direction finder.
3. What is Faraday's rotation ? Describe the construction and working of isolator.
4. What is negative resistance devices ? Explain the operation of tunnel diode as microwave amplifier.

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. What is modulation and demodulation ? Why is frequency modulation better than amplitude modulation ?
2. Determine whether a signal at 10 Gc/s will propagate in the $TE_{1,0}$ mode in a rectangular waveguide of dimensions $1'' \times 0.5''$ filled with air. Find phase constant.
3. Explain parametric amplifier.
4. Define Doppler effect and derive an expression for the Doppler frequency shift.
5. Discuss the cut-off wavelength and cut-off frequency of TE mode in cylindrical waveguides.
6. Write a short note on rat race ring.
7. Derive the expressions for output power and efficiency of two cavity Klystron amplifier.
8. Briefly describe the ratio detector.

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.

Fill in the blanks of the following :

1. The value of S_{12} in a E-plane tee is ..... .
2. The band width of Zoned lens antenna is ..... .

3. Gyrator produces a phase shift of ..... .
4. For low attenuation, the best transmission medium is ..... .
5. ..... is a microwave device in which the frequency of operation is determined by the biasing field strength.

Choose correct alternative :

6. The biggest advantage of the TRAPATT diode over the IMPATT diode is its :
   (a) higher efficiency
   (b) lower noise
   (c) ability to operator at higher frequencies
   (d) lesser sensitivity to harmonics
7. The Reflex Klystron can be used as :
   (a) amplifier only
   (b) oscillator only
   (c) both amplifier and oscillator
   (d) None of these
8. Which type of modulation causes envelope distortion of a base band signal ?
   (a) Amplitude modulation
   (b) Frequency modulation
   (c) Angle modulation
   (d) Phase modulation
9. Waveguides are used mainly for microwave signals because :
   (a) they depend on straight-line propagation which applies to microwaves only

(b) losses would be to too heavy at lower frequencies

(c) there are no generators powerful enough to excite them at lower frequencies

(d) they would be too bulky at lower frequencies

10. The attenuator in the TWT is used for :

(a) help focusing

(b) prevent saturation

(c) prevent oscillation

(d) increase gain