

Roll No.

PHY–554

Microwave Devices and Communication System

M. Sc. PHYSICS (MSCPHY–12/13/16)

Second Year, Examination, 2017

Time : 3 Hours

Max. Marks : 60

Note : This paper is of **sixty (60)** marks containing **three (03)** sections A, B and C. Learners are required to 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 fifteen (15) marks each. Learners are required to answer *two* (02) questions only.

1. What is S-matrix and derive scattering matrix for a two-port junction.
2. What is Faraday’s rotation ? Describe the construction and working of a Gyrator.
3. What is Travelling Wave Tube (TWT) ? Describe the principle of operation of TWT.
4. What is Radar ? Derive Radar range equations. Write the applications of Radar.

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

Note : Section 'B' contains eight (08) short answer type questions of five (05) marks each. Learners are required to answer *four* (04) questions only.

1. What are the advantages of a waveguide ?
2. Draw circuit diagram for collector modulation and base modulation and also explain its working.
3. Explain the following :
 - (a) Gain
 - (b) Efficiency
 - (c) Radiation resistance of an antenna.
4. Discuss about BARITT diode.
5. Define cut-off wavelength and cut-off frequency.
6. A wireless transmitter radiated 4 kW, with an unmodulated carrier wave and 5.2 kW with modulated wave. Assuming negligible distortion, calculate percentage of modulation.
7. Briefly describe the ratio detector.
8. Explain parametric up-converter.

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.

Write True *or* False against the following :

1. The waveguide dimension decreases as frequency is increased.

2. E-plane tee is series tee.
3. The working of a circulator is depend on the Doppler effect.
4. Tunnel diode is used for rectification.
5. IMPATT diode have low efficiency

Choose the correct alternative.

6. The value of S_{32} in a Hybrid tee is :
 - (a) 1
 - (b) $\frac{1}{2}$
 - (c) $\frac{1}{\sqrt{2}}$
 - (d) $-\frac{1}{\sqrt{2}}$
7. Condition for no-wave propagation in a waveguide is :
 - (a) $\lambda_O < \lambda_C \lambda_P$
 - (b) $\lambda_O < \lambda_C \lambda_P$
 - (c) $\lambda_O \ll \lambda_C$
 - (d) $\lambda_O = \lambda_C$
8. Antenna lens will be highly dispersive when refractive index (n) is :
 - (a) $n < 1$
 - (b) $n > 1$
 - (c) $n = 1$
 - (d) $n = 0$

9. Cellular phone works in the frequency range :
- (a) 30 kHz—300 kHz
 - (b) 300 kHz —3 MHz
 - (c) 300 MHz — 3 GHz
 - (d) 30 GHz — 300 GHz
10. The two cavity Klystron operates on the principle of :
- (a) Velocity modulation
 - (b) Amplitude modulation
 - (c) Frequency modulation
 - (d) None of these