

A-1194

Total Pages : 3

Roll No.

PHY-554

M.Sc. Physics (MSCPHY)

Microwave Devices and Communication System

Examination February, 2026

Time : 2:00 Hrs.

Max. Marks : 70

Note :- This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these Sections according to the detailed instructions given therein. *Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.*

Section-A

(Long Answer Type Questions) (2×19=38)

Note :- Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

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(1)

P.T.O.

1. Explain the theory of wave propagation in rectangular waveguides. Derive expressions for cutoff wavelength, phase velocity, and group velocity. Discuss dominant modes with neat diagrams.
2. Define scattering matrix (S-matrix). Explain its properties and derive the S-matrix of E-plane tee and H-plane tee with suitable diagrams.
3. Describe various waveguide components such as directional coupler, isolator, circulator, and attenuator. Explain their working principles and applications.
4. Explain the construction, working principle, and applications of a Two-Cavity Klystron Amplifier. Derive expressions for velocity modulation and bunching.
5. Describe the construction and operation of a cavity magnetron. Explain the role of crossed electric and magnetic fields.

Section–B

(Short Answer Type Questions) (4×8=32)

Note :- Section ‘B’ contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. Explain the basic principles of Radar. Describe Explain the working of tracking radar.
2. Explain the working principle of Travelling Wave Tube (TWT). Compare TWT with klystron amplifier.
3. Explain antenna fundamentals such as radiation resistance, bandwidth, gain, and directivity.
4. Explain TE and TM modes in rectangular waveguides. Why does TEM mode not exist in hollow waveguides ?
5. Derive the power conservation relation for a lossless microwave junction using scattering parameters.
6. Explain the principle of operation of ferrite isolator and circulator with suitable diagrams.
7. Explain the concept of electronic tuning in microwave devices. Discuss its importance in modern communication systems.
8. Explain the applications of radar in weather monitoring, air traffic control, and defense systems.
