K–891

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PHY–554

M.Sc. (Physics) IInd Year Examination Dec., 2023

MICROWAVE DEVICES AND COMMUNICATION SYSTEM

Time : 2 Hours] [**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 there in. ***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.

1. What is meant by modulation and demodulation ? Why is frequency modulation chosen over amplitude modulation ?

2. Discuss the characteristics of a two cavity klystron, including a detailed exploration of its operational principles. Additionally, derive the expression for both output power and efficiency.

3. What are the various categories of tracking radar systems ? Describe, with the help of a diagram, the process of angle tracking. Contrast two major tracking systems.

4. What are the properties of a rectangular waveguide ? Derive the expressions for the field equations of the TM mode within a rectangular waveguide.

5. What do you understand by the antenna and antenna theorem ? Define the concept of directivity. Provide a derivation for the directivity expression.

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. Illustrate the operational principles of a Traveling Wave Tube (TWT) with an appropriate diagram.

2. What do you mean by magnetrons ? List out the various categories of magnetron types.

3. What factors define the performance of a radio receiver ?

4. Describe the FM transmitter, with an appropriate diagram.

5. Find the power gain and directivity (D) of a horn antenna whose dimensions are 10 × 5 cm, operating at a frequency of 6 GHz.

6. Explain the functioning of a parabolic reflector.

7. Explain the concept of a waveguide. What are the characteristics associated with waveguides ?

8. An unmodulated earrier frequency is given by 2 MHz. After the frequency modulation, the maximum frequency is given by 2.4 MHz. Find the frequency deviation Δf and the minimum frequency f_{min}.

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