A–091

Total Pages : 3 **Roll No. .....**

MSCPH-509

M.Sc. PHYSICS (MSCPH)

(Electronics)

2nd Semester Examination, 2024 (June)

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.

Q. 1. (a) Enlist the ideal characteristics of op-amp. Why op-amp is called operational amplifier.

(b) Draw the circuit diagram of op-amp as summer and substractor and find the expression for output.

Q. 2. Draw the circuit diagram of half wave rectifier and full wave rectifier and explain its working ?

Q. 3. Draw and explain the input and output characteristics of common base configuration of bi-polar junction transistor. Indicate all the regions of operation.

Q. 4. What are the advantages of FET over a conventional bi-polar junction transistor ? Define pinch off voltage, amplification factor and drain resistance of FET.

Q. 5. How are integrated circuits classified based on their functionality ? Provide examples for each category. Discuss the limitations and challenges associated with the development of integrated circuits.

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.

Q. 1. Discuss the barrier formation of a PN junction diode. For a PN junction diode, draw the I-V characteristic and explain the Knee voltage and the leakage current.

Q. 2. Define photovoltaic effect. Draw I-V characteristics for a solar cell.

Q. 3. What is feedback in the context of transistor amplifiers ? How does negative feedback improve the stability and linearity of an amplifier circuit ?

Q. 4. What is FET transistor. Explain how an FET can be used as voltage controlled resistors.

Q. 5. Draw and explain the circuit of non-inverting amplifier and unity gain op-amp.

Q. 6. Describe the design and working principle of a high resistance DC voltmeter using an operational amplifier.

Q. 7. Explain the operation of a Zener diode. How does it differ from a regular diode ? How does a Zener diode maintain a constant voltage across its terminals ?

Q. 8. Describe the working principle of a charge-coupled device (CCD).

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