MPH-005

ASSIGNMENT BOOKLET

M.Sc. (Physics) Programme
(MSCPH)

ELECTRONICS

Valid from 1st January, 2026 to 31st December, 2026

School of Sciences
Indira Gandhi National Open University
Maidan Garhi, New Delhi-110068
(2026)

Dear Student,

Please read the section on assignments in the Programme Guide for M.Sc. (Physics). A weightage of 30 per cent, as you are aware, has been earmarked for continuous evaluation, **which would consist of one tutor-marked assignment** for this course. The assignment is in this booklet. The total marks for this assignment is 100, of which 40 marks are needed to pass it.

Instructions for Formatting Your Assignments

Before attempting the assignment please read the following instructions carefully:

1) On top of the first page of your answer sheet, please write the details exactly in the following format:

ENROLMENT NO.: ……

NAME: ……

ADDRESS: ……

COURSE CODE:……..

COURSE TITLE: ……

ASSIGNMENT CODE: ……..

STUDY CENTRE: …….. **DATE:** ……

PLEASE FOLLOW THE ABOVE FORMAT STRICTLY TO FACILITATE EVALUATION AND TO AVOID DELAY.

2) Use only foolscap size writing paper (but not of very thin variety) for writing your answers.

3) Leave 4 cm margin on the left, top and bottom of your answer sheet.

4) Your answers should be precise.

5) **Submit the complete assignment answer sheets containing Part A and Part B, within the due date.**

6) The assignment answer sheets are to be submitted to your Study Centre as per the schedule. **Answer sheets received after the due date shall not be accepted. We strongly suggest that you retain a copy of your answer sheets.**

7) This assignment is **valid from 1st January 2026 to 31st December 2026**. If you have failed in this assignment or fail to submit it by December 31, 2026, then you need to get the assignment for the year 2027, and submit it as per the instructions given in the Programme Guide.

8) **You cannot fill the examination form for this course** until you have submitted this assignment. For any queries, please contact: sgokhale@ignou.ac.in or mbnewmai@ignou.ac.in. Please note that we do not provide answers to the questions in this Assignment.

We wish you good luck.

Tutor Marked Assignment
ELECTRONICS

Course Code: MPH-005
Assignment Code: MPH-005/TMA/2026
Max. Marks: 100

Note: Attempt all questions. The marks for each question are indicated against it.

PART A

1. a) Describe various electron-hole pair generation processes in semiconductor. (5)

   b) Explain the complete switching ON and OFF cycle of a power diode with the help of appropriate diagram. What are forward and reverse recovery times of a power diode? (4+1)

   c) How can the efficiency of a solar cell be increased? How is the optimum bandgap chosen for the solar cell material? (5)

2. a) Describe the difference between the construction and operation of enhancement mode and depletion mode MOSFET. (5)

   b) What are the causes of non-ideal characteristics of a *p-n* junction diode? (5)

3. a) Define intrinsic stand-off ratio of a UJT. Draw and explain the *I-V* characteristic of UJT. (1+4)

   b) In single ended input – single ended output configuration of a differential amplifier, the input voltage is 10 mV. If the collector resistors R_{C1}= R_{C2}= 47kΩ, emitter resistor R_E= 39 kΩ and supply voltage is ± 12V, calculate the differential gain and output voltage of the circuit. Assume that the you are using Si transistors. (5)

4 a) Draw the lead-lag network of Wien bridge oscillator and obtain the expression for its oscillation frequency and required amplifier gain using time domain analysis. (1+4)

   b) Draw and explain the equivalent *LCR* resonant circuit of an oscillating crystal. A crystal has *C* = 0.04 pF, *L* = 1 H and *R*= 2 kΩ. Calculate its series resonant frequency. What is the effect of the crystal thickness on its frequency? (2+2+1)

   c) Describe the construction of Gunn diode. Explain with the help of *E-k* diagram the origin of negative resistance region in its *I-V* characteristics. (1+4)

PART B

5. a) Design and draw the circuit using op amps to solve the following simultaneous equations:

$$3x + 4y = 12$$

$$x - 4y = 20$$ (5)

b) Design and draw the circuit of a non-inverting Schmitt trigger using op-amp with hysteresis of 40% of $\pm V_{SAT}$. (5)

6. a) What are CMRR and slew rate of an op-amp? Explain with examples their effects on the performance of an op-amp. (2+3)

b) Explain the working of an op-amp based full wave precision rectifier with the help of appropriate circuit diagram. What are its advantages over a simple diode rectifier? (3+2)

c) Draw the circuit of antilogarithmic amplifier using an op-amp and obtain the expression for its output voltage. (5)

7. a) Explain the working of a shunt regulator using zener diode. What are the limitations of this circuit due to the non-idealities of the zener diode? (3+2)

b) Explain the terms lock range and capture range with reference to PLL. Why is the capture range smaller than the lock range? (3+2)

8. a) Describe the software techniques used for improving the signal-to-noise ratio of an electronic system. (5)

b) Output of a 4-bit DAC for digital input of 1001 is 4.5 V. Determine its step size and percentage resolution. What will be the output for digital input of 1110? (2+2+1)

. c) Write an Assembly language program for microcontroller 8051 to compute the average of 6 bytes data stored from RAM location 45H and store the result at RAM location 30H. (5)

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