2020

PHYSICS – GENERAL

Practical Paper

PAPER: IVB

Full Marks: 50

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Module I (Computer lab)

Marks-25

*Answer **any one** from the following questions.*

1. Write a program in C or Fortran to sort the following numbers in ascending and descending order. Also find the smallest and largest number.

[43, 67, 32, 87, 21, 9, 98, 67]

2. Write a program in C or Fortran to find the mean, median and mode of the following numbers-

[33, 55, 77, 22, 99, 11, 66, 44, 88]

3. Write a program in C or Fortran to find the real or imaginary roots of the following quadratic equation-

$$7x^2 - 5x + 9 = 0$$

4. Write a program in C or Fortran to add and subtract following two 3×3 matrices-

$$\begin{bmatrix} 3 & 5 & -2 \\ 7 & -3 & 6 \\ -9 & 6 & 3 \end{bmatrix} \text{ and } \begin{bmatrix} -4 & 5 & 7 \\ 2 & -8 & 9 \\ 6 & 3 & -7 \end{bmatrix}$$

Please Turn Over

Module II

Marks-25

*Answer **any one** from the following questions.*

5. To use OP AMP as non-inverting amplifier –

(a) Draw the circuit diagram.

(b) Calculate V_0 , when V_i = 0.1 V, 0.2 V, 0.4 V, 0.5 V, 0.7 V.

[Given, R_1 = 1 kΩ , R_2 = 10 kΩ]

(c) Calculate gain in each case.

(d) Draw a graph V_0 against V_i .

(e) What are the characteristics of an ideal OP AMP ? (5+5+5+8+2)

6. To use OP AMP as inverting amplifier –

(a) Draw the circuit diagram.

(b) Calculate V_0 , when V_i = 0.1 V, 0.3 V, 0.4 V, 0.6 V, 0.8 V.

[Given, R_1 = 1 kΩ , R_2 = 5 kΩ]

(c) Calculate gain in each case.

(d) Draw a graph V_0 against V_i .

(e) Mention some of the uses of OP AMP ? (5+5+5+8+2)

7. To use OP AMP as differential amplifier –

(a) Draw the circuit diagram.

(b) Calculate V_0 , when V_1 = 0.1 V, V_2 = 0.2 V ; when V_1 = 0.2 V, V_2 = 0.5 V ; when V_1 = 0.3 V, V_2 = 0.7 V ; when V_1 = 0.4 V, V_2 = 0.9 V ; and when V_1 = 0.4 V, V_2 = 1 V.

[Given, R_1 = 1 kΩ , R_2 = 10 kΩ]

(c) Calculate gain in each case.

(d) Draw a graph V_0 against V_i .

(e) What do you understand by virtual ground of an OP AMP ? (5+5+5+8+2)

Please Turn Over

8. To use OP AMP as three input adder –

(a) Draw the circuit diagram.

(b) Calculate V_0 , when V_1 = 0.1 V, V_2 = 0.2 V, V_3 = 0.3 V ; when V_1 = 0.2 V, V_2 = 0.3 V, V_3 = 0.5 V ; when V_1 = 0.3 V, V_2 = 0.5 V, V_3 = 0.6 V ; and when V_1 = 0.4 V, V_2 = 0.6 V, V_3 = 0.8 V . [Given, $R_1 = R_2 = R_3 = 1$ kΩ , $R_f = 5$ kΩ]

(c) Draw a graph V_0 against V_i .

(d) Why is an OP AMP usually used with a negative feedback ?

(e) What is offset null adjustment of an OP AMP ? (5+8+8+2+2)

9. To convert a given ammeter into a voltmeter –

(a) Draw the circuit diagram.

(b) Write down the working formula.

(c) Find out the multiplier resistance (R_s), for current (I_m) = 100 μA , voltage (V) = 1 V and internal resistance (R_m) of the ammeter, R_m = 1 kΩ .

(d) Using following data draw a calibration graph of prepared voltmeter reading (V_{prep}) against standard voltmeter reading (V_{std}) , for conversion of an ammeter of range (0–100) μA into a voltmeter of range (0–1) V.

V_{prep} (Volt)	0.1	0.2	0.3	0.5	0.7
V_{std} (Volt)	0.15	0.25	0.35	0.55	0.75

(5+5+5+10)

10. To convert a given voltmeter into an ammeter –

(a) Draw the circuit diagram.

(b) Write down the working formula.

(c) Find out the shunt resistance (R_{sh}), where current for full deflection of voltmeter (I_m) = 100 μA , I = 100 mA , voltage (V) = 1 V and internal resistance (R_m) of the ammeter, R_m = 10 kΩ .

(d) Using following data draw a calibration graph of prepared ammeter reading (I_{prep}) against standard ammeter reading (I_{std}) , for conversion of a voltmeter of range (0–1) V to an ammeter of range (0–100) mA.

I_{prep} (mA)	10	20	40	60	80
I_{std} (mA)	15	25	45	65	85

(5+5+5+10)