

2023
M.Sc.
Fourth Semester
CORE – 12
PHYSICS
Course Code: MPHC 4.21
(Experimental Methods)

Total Mark: 70
Time: 3 hours

Pass Mark: 28

Answer five questions, taking one from each unit.

UNIT-I

1. (a) Explain accuracy and precision. Why accuracy and precision need to be matched properly? 4+2=6
(b) Distinguish between error and correction. How can we express them for an instrument? 4+2=6
(c) What are arithmetic mean and average deviation? 2

2. (a) Describe the types of test signals by which physical systems are studied and analysed for their dynamic behaviour. 3+3=6
(b) Distinguish between periodic and aperiodic signals. Give example for both. 2+2=4
(c) What are thermal noise and shot noise? 2+2=4

UNIT-II

3. (a) Obtain an equation relating the dynamic and static sensitivities of a first-order system. Show how the output varies with time. 3+3=6
(b) What are the characteristics of a zero-order system? How does it react to standard test input signals? 3+3=6
(c) Define a linear system. 2

4. (a) What is the principle of energy coupling? Elaborate more on energy coupling. 2+4=6

- (b) What is multi-ground connection? Why is it dreaded in electronic instrumentation system? 3+3=6
- (c) Write a short note on electrostatic shielding. 2

UNIT-III

5. (a) Explain the use thermocouple for the measurement of surface temperature of a body. Write the characteristics of the thermocouple. 5+2=7
- (b) Describe the linear position transducer of a strain gauges for measurement of force. Write two applications. 5+2=7
6. (a) Explain how a piezoelectric crystal is cut to serve as a transducer and show that the crystal is most suitable for force measurements. 7
- (b) Describe an ionization vacuum gauge and explain its operation. 7

UNIT-IV

7. (a) What is digital multimeter? With proper electrical circuit diagram give the working and basic operation of DVM, DAM and DOM. 2+4+4+4=14
8. (a) Draw the block diagram of LCR bridge. Discuss the working operation of digital LCR bridge for measuring L and C. Write two important applications. 2+6+2=10
- (b) What are analog and digital instruments? 4

UNIT-V

9. (a) Describe the mean free path with regards to the molecules of a gas in random motion. What are the important conclusions drawn? 5+3=8
- (b) Write short notes on Penning pressure gauge. 6
10. (a) What is vacuum chamber? Discuss positive displacement and momentum transfer pump. 2+4+4=10
- (b) Write a short note on pumping speed. 4