

2023

PHYSICS

Paper : PHYSE3012

(Physics Workshop Skill)

Full Marks : 50

Pass Marks : 20

Time : 2 hours

*The figures in the margin indicate full marks
for the questions*

1. Choose the correct answer (any five) : $1 \times 5 = 5$

(a) Which unit is used to measure the amount of substance?

(i) Mole

(ii) Kelvin

(iii) Candela

(iv) Meter

(b) Which manufacturing method involves the shaping of material through the use of a mole?

(i) Casting

(ii) Welding

(iii) Machining

(iv) Forming

(2)

- (c) Which process involves the shaping of metal using compressive forces?
- (i) Forging
 - (ii) Welding
 - (iii) Brazing
 - (iv) Sintering
- (d) The vertical axis of an oscilloscope typically represents
- (i) time
 - (ii) frequency
 - (iii) voltage
 - (iv) amplitude
- (e) What is the primary purpose of a gear system?
- (i) To increase friction
 - (ii) To transfer energy between shafts or axles
 - (iii) To reduce the speed of rotation
 - (iv) To decrease mechanical advantage

24KB/139

(Continued)

(3)

- (f) If 0.01 m is in SI system, the value in CGS system will be
- (i) 0.00001
 - (ii) 1
 - (iii) 10
 - (iv) None of the above
- (g) A screw gauge with pitch 0.5 mm and 100 number of divisions in the circular scale has least count
- (i) 0.01 mm
 - (ii) 0.001 mm
 - (iii) 0.005 mm
 - (iv) None of the above
- (h) Hacksaw frames are of
- (i) two types
 - (ii) three types
 - (iii) four types
 - (iv) None of the above
- (i) 10 N is equal to
- (i) 10^7 dynes
 - (ii) 10^{-5} dyne
 - (iii) 10^6 dynes
 - (iv) None of the above

24KB/139

(Turn Over)

(4)

- (j) An inductor is an example of
- (i) passive component
 - (ii) active component
 - (iii) partly active and partly passive component
 - (iv) None of the above

2. Answer any *five* of the following questions :
2×5=10

- (a) What is the utility of a Vernier calliper? Explain the main components of a Vernier calliper. 1+1
- (b) Define porosity in welding. What is a common metal used in construction for its structural strength and durability? 1+1
- (c) Define the primary function of a milling machine and name a common type of milling operation used to create flat surfaces on a workpiece.
- (d) Explain the function of a surface finish gauge.
- (e) Explain the term 'time constant' in relation to timer circuits.
- (f) Write the primary function of a regulated power supply. Define the term 'ripple'. 1+1
- (g) How does a lever help in lifting heavy weights? 2

(5)

3. Answer any *five* of the following questions :
5×5=25

- (a) A screw gauge has 50 divisions on the circular scale, and the pitch of the screw is 0.5 mm. Calculate the least count of the screw gauge. Explain how the least count affects the precision of measurements using the screw gauge.
- (b) Explain the casting foundry process, highlighting its stages and the types of casting methods used. Provide examples of industries or applications where each casting method is commonly employed. 3+2
- (c) Discuss the significance of weld quality, safety considerations, and the importance of different welding techniques in various industries.
- (d) Discuss the differences between regulated and unregulated power supply.
- (e) Explain the fundamental principle of a cathode ray oscilloscope, detailing the function and operation of its major components.
- (f) Describe the process of fixing gears onto a motor axle for a mechanical system and write the importance of gear alignment, spacing and securing methods to ensure smooth and efficient power transmission.

(6)

- (g) Explain the working principle of a lever mechanism. Describe the different classes of levers and their applications in various mechanical systems.
- (h) Explain the principle of operation of a multimeter and discuss how to use a multimeter to measure current. Explain how to set up a multimeter to measure current in a circuit, including selecting the correct current range and connecting the probes properly.
- (i) What is a multimeter? How will you determine whether a transistor is PNP or NPN with the help of a digital multimeter?

4. Answer any one of the following questions : 10

- (a) Explain the concept of a pulley system and discuss how the number of pulleys affects the mechanical advantage and the force required to lift a load. Provide mathematical examples illustrating the relationship between the number of pulleys and the force applied, considering ideal and real world scenarios.
- (b) Describe the soldering process for resistors, capacitors, inductors, diodes onto a PCB. Write the challenges and precautions involved in soldering

24KB/139

(Continued)

(7)

integrated circuits (ICs) onto a PCB. Explain the use of heat sinks, preheating methods, and temperature-controlled soldering irons in ensuring proper soldering of ICs.

- (c) Explain the principle behind using a sextant to measure the height of buildings or mountains. Describe the setup and procedure for employing a sextant to determine the angular elevation angle of the top of a building or mountain from a known horizontal distance.

24KB-250/139 63/1 (SEM-3) SEC1/PHYSE3012