

Indian Maritime University
(A Central University, Govt of India)

Sep/Oct'25 SE

Programme Name: B Sc (NS)

Semester: I

Subject Code: UG21T6103

Subject Name: PHYSICS

Date: 09.09.2025

Max Marks: 70

Duration: 03 Hrs

Pass Marks: 35

General Instructions

- (i) All Sections (A, B & C) are to be attempted.
- (ii) Options, if any, are specified in respective section.

Section A

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable.

1. What determines whether an object will float or sink when placed in a fluid?
 - A) The shape of the object.
 - B) The density of the object relative to the density of the fluid.
 - C) The temperature of the fluid.
 - D) The colour of the object.

2. Which of the following is a key principle behind the operation of a gyroscope?
 - A) Conservation of energy
 - B) Conservation of angular momentum
 - C) Pascal's principle
 - D) Bernoulli's principle

3. What is the typical range of frequencies for audible sound in humans?
 - A) 1 Hz to 20 kHz
 - B) 20 Hz to 20 kHz
 - C) 20 Hz to 200 kHz

D) 100 Hz to 10 kHz

4. What is the primary function of a hatch cover on a ship?

- A) To provide ventilation
- B) To prevent water ingress and protect the cargo
- C) To enhance the ship's speed
- D) To serve as a communication platform

5. The angle measured by a sextant is known as what?

- A) Altitude
- B) Bearing
- C) Angle of elevation
- D) Arc

6. Which imaging technique uses X-rays to create cross-sectional images of the body?

- A) MRI
- B) Ultrasound
- C) CT scan
- D) PET scan

7. What is the primary effect of mutual induction?

- A) Induction occurs in the same coil
- B) A changing current in one coil induces EMF in another coil
- C) Induction does not occur
- D) It only occurs in transformers

8. What is the main factor that affects the amount of heat generated by an electric current in a conductor?

- A) The length of the conductor
- B) The temperature of the conductor
- C) The resistance of the conductor
- D) The type of current (AC or DC)

9. What is a thermistor primarily used for?

- A) Measuring voltage
- B) Measuring current
- C) Temperature sensing and control
- D) Storing electrical energy

10. In a Yagi-Uda antenna, what is the role of the reflector?

- A) To receive signals
- B) To enhance gain and directivity
- C) To match impedance
- D) To provide support structure

Section B

Five Questions of 02 Marks each

11.State Bernoulli's Theorem.

12. How are frequency and pitch related in the context of sound waves?

13. What are radio waves, and what are their common applications?

14. What are some common examples of static electricity that people experience in daily life.

15. what is the primary function of an antenna in communication systems?

Section C

Seven Questions of 10 Marks each of which any 05 questions to be answered.

16. a) How does a spinning gyroscope resist change in its orientation.(7)

b) A solid sphere of mass 7 kg and radius 0.3 m, has a moment of inertia about its central axis given by $I = \frac{2}{5} MR^2$. calculate the radius of gyration of the solid sphere. (3)

17.a) Explain with neat block diagram, the application of reflection to the measurement of depth by echo sounder. (7)

b) A train is moving towards a stationary observer at a speed of 20 m/s. The frequency of the sound produced by the train whistle is 500 Hz. if the speed of sound in air is 340 m/s. calculate the frequency heard by the observer. (3)

18. a) How does a sextant measure angles between celestial objects and the horizon? (7)

b) A light ray travels from water ($n_1=1.33$) into air ($n_2=1.00$). calculate the critical angle for the total internal reflection at the water-air interface. (3)

19. a) How is a Periscope used in submarines. (7)

b) A refrigerator has a COP of 5 and removes 300 KJ of heat from the cold reservoir. calculate the work input to the refrigerator. (3)

20. a) How does Pascal's law enable the operation of Hydraulic lift. (7)

b) A sound source produces a sound intensity of $1 \times 10^{-4} \text{ W/m}^2$. calculate the sound intensity level in decibels. (3)

21. a) State Kirchoff current and voltage law and what fundamental principle does it represent. (7)

b) A light bulb draws 0.5 A of current, when connected to a 120 V source. What is the resistance of the light bulb. (3)

22. a) How do Radar transmitters and receiver coordinate their operation in a Radar system. (7)

b) What are some applications of Thermistors in everyday devices and industrial applications. (3)