

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

Sep/Oct'25 SE

Programme Name: DNS

Semester: I

Subject Code: UD11T6103

Subject Name: PHYSICS

Date: 03.09.2025

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. Which of the following is an example of centripetal force?
 - a) A car sliding outward on a sharp turn
 - b) The tension in a string while swinging a ball in a circle
 - c) The frictional force resisting motion on a flat surface
 - d) Gravity pulling a ball downward
2. A ship floats on water because:
 - a) It is made of steel
 - b) Its overall density is less than that of water
 - c) It is very large
 - d) It has a high buoyant force
3. Which of the following applications uses the Doppler Effect?
 - a) Sonar
 - b) Ultrasound imaging
 - c) Radar speed guns
 - d) All of the above
4. Which type of electromagnetic radiation is primarily used for communication?

- a) Radio waves
- b) Microwaves
- c) X-rays
- d) Gamma rays

5. What is self-induction?

- a) The phenomenon where a change in current in a coil induces a voltage in another coil
- b) The phenomenon where a changing current in a coil induces a voltage in itself
- c) The flow of current in a circuit
- d) The generation of magnetic fields by permanent magnets

6. When a circuit is open, the EMF of a battery is:

- a) Zero
- b) Equal to the voltage across the terminals
- c) Negative
- d) Equal to the current flowing through the circuit

7. Which medium does sound travel fastest in?

- a) Air
- b) Water
- c) Steel
- d) Vacuum

8. Why is nichrome used as a heating element in many devices?

- a) It has high electrical resistance
- b) It has a high melting point
- c) It can withstand high temperatures
- d) All of the above

9. Which of the following factors primarily determines the range of a radar system?

- a) Antenna size
- b) Wavelength of the signal
- c) Transmitter power
- d) Pulse repetition frequency

10. Which principle is used in a Venturi meter to measure flow rate?

- a) Archimedes' principle
- b) Bernoulli's principle
- c) Pascal's principle
- d) Faraday's law

Section B

Five Questions of 02 Marks each

11. Define the term "Gyro inertia".
12. Define one decibel.
13. What happens when the angle of incidence is greater than the critical angle?
14. What is electromotive force (EMF)?
15. What is flow rate? What is the SI unit of flow rate?

Section C

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

- 16.a) State Archimedes principle. How can Archimedes' principle be applied in designing ships and submarines? (7)
- b) A rock of mass 12 kg is lifted to a height of 50 meters. Calculate the gravitational potential energy gained by the rock. (3)
- 17.a) What are the three mechanisms of heat transfer? (7)
- b) A sound source emitting a frequency of 400 Hz is moving towards a stationary observer at a speed of 15 m/s. If the observer is moving towards the source at a speed of 10 m/s and the speed of sound is 340 m/s, what frequency does the observer hear? (3)
- 18.a) What is a hatch cover? Why are hatch covers important on ships? (7)
- b) A research vessel uses an echo sounder and records a depth of 1200 m. If the speed of sound in water is 1450 m/s, how long does it take for the echo to return? (3)

19.a) Explain the skywave and space wave propagation of radio waves in detail.

(7)

b) An observer at sea uses a sextant to measure the angle of elevation of a distant ship at 10 degrees. If the ship is 2 km away, what is the height of the observer's eye level above sea level? (3)

20.a) How does total internal reflection work in optical fibers? What are some practical applications of total internal reflection? (7)

b) How much heat is required to melt 200 g of ice at 0°C into water at 0°C? (The latent heat of fusion of ice is $L_f=334$ J/g). (3)

21.a) State ohms law. Can Ohm's Law be applied to both AC and DC circuits? (7)

b) A battery with an emf of 12V has an internal resistance of $1\ \Omega$. If the battery is connected to a load resistance of $3\ \Omega$, calculate the current flowing through the circuit. (3)

22.a) Explain with neat block diagram the working of Radio transmitter and receiver. (7)

b) An antenna has a power input of 120 W and radiates 50 W in a specific direction. Calculate the antenna gain. (3)