Indian Maritime University

(A Central University, Govt of India)

End Semester Examinations – December 2025

Programme Name: B Sc (Nautical Science)

Semester: I

Subject Code: UG21T6103

Subject Name: Physics

Date: 11.12.2025	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.
(iii) Non programmable scientific calculator allowed.

Section A

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

1. Archimedes' principle helps to calculate the buoyancy of any floating object that is _____ immersed in a fluid.
(a) Only partially (b) Only completely (c) both partially and completely (d) Neither partially nor completely

2. What happens to the radius of the circle when the centripetal force increases?
(a) The radius increases (b) The radius decreases (c) The radius remains the same (d) The radius becomes infinite.

3.An Ultrasonic wave is sent from a ship towards the bottom of the sea. It is found that the time interval between the sending and receiving of the wave is 3.5 seconds. What is the depth of the sea, if the velocity of sound in the seawater is 1700 m/sec?

(a) 1400 m (b) 2240 m (c) 2805 m (d) 1740 m

4. Moment of inertia is defined as the resistance to _____
(a) Linear acceleration (b) Angular acceleration (c) Velocity (d) Angular displacement

5. Which type of radio wave propagation is considered for line-of-sight (LOS) Communication?
(a) Ground Wave (b) Space Wave (c) Surface Wave (d) Sky Wave

6.A microwave oven uses electromagnetic waves with a wavelength of 12 cm. What is the frequency of these waves ----------

7.What does a sextant primarily measure in marine navigation?

(a) Atmospheric pressure (b) Angle between a celestial object and the horizon
(c) Depth of the sea (d) Speed of the vessel.

8.When the current in a coil changes from 5 A to 0 A in 0.1 seconds and induces 2 V in a neighbouring coil, the mutual inductance is_____

9.In a Yagi-Uda antenna, the element connected to the transmitter or receiver is called the

(a) Director (b) Reflector (c) Driven element (d) Passive element

10. The material used to make thermistors is usually

(a) Semiconductor oxides (b) Pure Metals (c) Insulator (d) None

Section B

Attempt all five Questions of 02 Marks each:

11. State Kirchhoff's current law.

12. State Pascal's Law.

13. Define RMS value of supply.

14. What is critical angle?

15. What is Doppler effect?

Section C

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

16.What do you understand by?

(a) Moment of inertia and Radius of gyration **[4M]**
(b) Angular acceleration and Angular momentum **[3M]**

(d) Work, Energy and Power **[3M]**

17.(a) Discuss how the principle of reflection of sound is applied in marine technology, with reference to the use of echo sounders for measuring water depth **[6m]**

(b) A source of sound is travelling towards a stationary observer. The frequency of sound heard by the observer is 25% more than the actual frequency. If the speed of sound is v, that of the source is. **(4m)**

18.a) State the various gas laws with their mathematical expressions. **(4m)**

b) State TIR and explain the application of TIR in Periscope. **[6M]**

19.a) Write short notes on the electromagnetic (EM) spectrum. **(5m)**

b) State Ohm's Law. Explain its mathematical expression and give its limitations. **(5m)**

20. a) State and prove the principle of Sextant with the help of diagram. **(7m)**

b) Calculate the critical angle for a glass-water interface if the refractive indices of glass and water are 3/2 and 4/3 respectively. **(3m)**

21.a) If a coil of 150 turns is linked with a flux of 0.01 wb when carrying a current of 1.0 Amp, calculate the inductance of coil. Now, if current is uniformly reversed in 0.1 sec, calculate the induced emf. **(3m)**

b) How do Radar transmitters and receiver coordinate their operation in a Radar system? **(7m)**

22.a) b) Explain the thermistor and its application as heat sensors. **(7m)**

b) A Lamp load of 1000 Ω resistance is connected across the DC supply of 25 V. What is the power absorbed in lamp and what amount of heat will be released in 10 seconds? **(3m)**

Q No 3: An echo from the seafloor is received 3.2 seconds after sending the pulse. The depth at this location is 2400 metres. Calculate the speed of sound in water.

a)1200 m/s

b)1500 m/s

c)2200 m/s

d)2400 m/s