Indian Maritime University

(A Central University, Govt of India)

End Semester Examinations – June 2023

Programme Name: B Sc (NS)

Semester: 1st

Subject Code: UG21T5103

Subject Name: Physics

Date: 08.06.2023	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 the respective section.

Section A

Answer all questions. [10 x 1 = 10]

1. State True or False.
   Hygrometer is an instrument used in meteorological science used to measure the relative humidity or amount of water vapour in the air.
   (a) True
   (b) False

2. Identify the correct statement with respect to Total Internal Reflection.
   (a) The angle of incidence is less than the critical angle.
   (b) The angle of incidence is greater than the critical angle.
   (c) The angle of incidence is equal to the critical angle.
   (d) The angle of incidence is not at all related to the critical angle.

3. The wavelength(approximate) of Infrared Red (IR) waves are:
   (a) 4×10^{-7}m to 8×10^{-7}m
   (b) 8×10^{-7}m to 3×10^{-5}m
   (c) 6×10^{-10}m to 4×10^{-7}m
   (d) 10m to 10^{4}m

4. Where on the surface of Earth is the angle of dip 90°?
   (a) Equator
   (b) North pole
   (c) South pole
   (d) Both (b) and (c)

5. "A metal spoon becomes hot when it is kept inside a cup". The given situation is an example of which heat transfer mechanism:
   (a) Radiation

(b) Conduction
(c) Convection
(d) Heat is not at all transferred in the process

6. SI unit of Latent Heat of Fusion is:
(a) J kg^{-1} (b) J kg^{-1} k^{-1}
(c) J K^{-1} (d) J g^{-1}

7. Factors that affect the speed of sound in seawater are:
(a) Temperature
(b) Pressure
(c) Salinity
(d) All of these

8. State True or False:
Barometer is used to measure the rate of flow of liquid.
(a) True
(b) False

9. Bronze is an alloy that primarily contains:
(a) Iron
(b) Copper
(c) Silicon
(d) Aluminium

10. State True or False:
Rotational Inertia is also known as the Moment of Inertia.
(a) True
(b) False

Section B (02 x 05 = 10 marks)

11. Define centre of gravity of a body.
12. State first law of thermodynamics.
13. Draw the ray diagram of prism binocular.
14. State Archimedes principle.
15. State the conditions for a periodic motion to be simple harmonic motion

Section C

Answer any 5 questions. [5 x 10 = 50]

16.
(a) Mention 3 differences between streamlined flow and turbulent flow.
(b) A cylinder with a radius of 11cm and height of 3.4cm has a mass of 10kg. What is the apparent weight of the cylinder when it is submerged in water?

[6+4=10]

17. Write a short note on:
(a) Ship sweat
(b) Periscope [5+5=10]

18.
(a) Define the term velocity ratio, efficiency and mechanical advantage of any machine.
(b) Derive the relationship between any machine's velocity ratio, efficiency and mechanical advantage. [6+4=10]

19.
(a) Discuss the working principle of sextant with a proper diagram.
(b) The larger and the smaller diameters of a differential wheel and axle are 80mm and 70mm respectively. The effort is applied to the wheel of 250mm. What is the velocity ratio of the machine? [6+4=10]

20.
(a) Enumerate the differences between the soft magnetic material and the hard magnetic material.
(b) Velocity of light in a liquid is 1.5×10^8 m/. Calculate the critical angle if a ray of light passes from this liquid to air. [6+4=10]

21.
(a) An observer approaches a stationary 1000 Hz sound source at twice the speed of sound. What frequency does the observer hear? The speed of sound in air is 343m/s.
(b) Explain alloys with proper examples. Mention some of the properties of alloys. [5+5=10]

22.
(a) A 2m long steel rod has a cross-sectional area of 0.30 cm^2. The rod is part of a vertical support that holds a heavy 550-kg platform that hangs attached to the rod's lower end. Ignoring the weight of the rod, what are the tensile stress in the rod and the elongation of the rod under the stress? Young's Modulus of Steel = 2×10^{11} Pa
(b) In a hydraulic lift, the surface area of the input piston is $10m^2$. The surface area of the output piston is 3000 m^2. A 100N force is applied to the input piston that raises the piston by 1m. Calculate the work done. [6+4=10]