

INDIAN MARITIME UNIVERSITY
(A Central University, Government of India)
End Semester Examination Dec 2019/Jan 2020
B.Sc. (Nautical Science)
Semester -I
UG21T4103 - Nautical Physics

Date: 14.12.2019
Time: 3 Hours

Max Marks: 70
Pass Marks: 35

Note: Question no. 1 is compulsory.
Scientific non-programmable calculator is allowed.

Part A
Compulsory questions
(2 × 5 = 10 marks)

- Q.1 a) Define critical angle of a medium.
b) State first law of thermodynamics.
c) State conditions for a motion to be simple harmonic motion.
d) State Hooke's law.
e) What is the difference between sensible heat and latent heat.

Part B
Attempt any six from remaining eight questions. All questions carry equal marks.
(6 X 10 = 60 marks)

- Q.2 a) Define relative humidity. Discuss hair hygrometer in detail with diagram. (5 marks)
b) What mass of ice at 0°C should be added to 250g of water, so as to reduce its temperature from 35°C to 25°C? (Assume that all ice melts) (Specific heat capacity of water is 4.2 J/g°C, latent heat of fusion of ice is 336J/g). (5 marks)
- Q.3 a) Explain construction and working of a terrestrial telescope with help of a ray diagram. (5 marks)
b) An image is formed on a screen placed at a distance of 15 cm from a convex lens of focal length 10 cm. Find the position of the object and magnification produced by the lens. (5 marks)

- Q.4 a) What is the velocity of sound in liquid and solid? Also mention the relation between them. (5 marks)
- b) What would be the sound level of a sinusoidal wave of frequency 3000 Hz in air, with an amplitude of 0.2 mm? Assume the density to be 1.29 kgm^{-3} and the velocity of sound in air to be 330 ms^{-1} . (5 marks)
- Q.5 a) Explain with block diagram, the concept of echo sounder in detail. (5 marks)
- b) Derive an expression for efficiency of a Weston's differential pulley block. (5 marks)
- Q.6 What is streamline and turbulent flow? State and prove Bernoulli's theorem. (10 marks)
- Q.7 a) Explain thermal expansion in liquids. Discuss its application to liquid cargo. (5 marks)
- b) What is total internal reflection? State conditions for its occurrence. Discuss one example of total internal reflection. (5 marks)
- Q.8 a) Define surface tension of a liquid. Derive an expression for surface tension, using capillary rise method. (5 marks)
- b) Find the work done in stretching a wire of 1 mm^2 cross-section and 2 m length through 0.1 mm if the Young's modulus of the material of the wire is $2 \times 10^{11} \text{ Nm}^{-2}$. (5 marks)
- Q.9 a) Explain ship's magnetism and its various components. (5 marks)
- b) Define the term: Angle of dip. Calculate the earth's total magnetic field at a place, where the angle of dip is 45° and $H = 0.8 \text{ Gauss}$. (5 marks)
