Indian Maritime University

(A Central University, Govt of India)

End Semester Examinations – December 2023

Programme Name: B Sc (NS)

Semester: I

Subject Code: UG21T5103

Subject Name: Physics

Date: 22.12.2023 **Max Marks: 70**
Time: 3 Hours **Pass Marks: 35**

Note: Part A and B is compulsory.
Answer any 5 questions from Part C (each of 10 marks).
Scientific Calculator is permitted if required.

Part A
(10 X 1 = 10 marks)

1) The angle of dip varies with:

a) Time of day b) Geographic location c) Weather conditions d) Altitude

2) The no. of stages / sequences in one Carnot cycle are:
a) 2 b) 3 c) 4 d)5

3) Which of the following materials is a good conductor of heat?

a) Wood b) Plastic c) Copper d) Styrofoam

4) Which of the following is not part of the electromagnetic spectrum?

a) Ultraviolet b) Infrared c) Sound waves d) X-rays

5) Which of the following statement(s) are true for "Reynolds numbers" in fluid dynamics.
a) It helps to categorise between laminar flow and turbulent flow, and it is a dimensionless no.
b) It helps to categorise between laminar flow and turbulent flow, and it is unit is Pascal
c) It helps to categorise between Fluid of different density and its unit is Poise
d) Both (a) & (c) are correct

6) In the context of sound, a 10 dB increase in intensity represents:

a) A doubling of sound intensity

b) A halving of sound intensity

c) No significant change in sound intensity

d) A decrease in frequency

7) In which type of flow, streamline or turbulent, is the concept of Reynolds number most applicable?

a) Streamline flow b) Turbulent flow c) Both d) Neither

8) The angle between the compass needle and the magnetic needle to the presence of iron within the ship is known as:
a) Induced Magnetism
b) Magnetising Force
c) Magnetic Deviation
d) Magnetic Variation

9) Identify the correct statement:
a) The Pressure in a fluid at rest is same at all points
b) The Pressure in a fluid varies with depth
c) The Pressure in a fluid depends on the density
d) All of these

10) S I Unit of specific heat Capacity is
a) $J\ K^{-1}$ b) $J\ kg^{-1}\ k^{-1}$
c) $Cal\ g^{-1}\ K^{-1}$ d) $J\ kg^{-1}$

Part B
(5 X 2 = 10 marks)

11) State Pascal`s Law?

12) State the phenomenon of Total internal reflection to take place.

13) Define Doppler Effect.

14) Define centre of mass and centre of Gravity.

15) Define Angle of Repose.

Part C
(5 X 10 = 50 marks)

Q.16 a) Define angle of dip. Find the value of dip angle at any point for which the horizontal component and vertical component of earth's magnetic field are equal. (5 marks)

b) State the differences between the hard and soft magnetic material. (5 marks)

Q.17 (a) What is a hygrometer? (2 marks)

(b)Calculate the heat required to convert 3 kg of ice at – 12 degrees Celsius kept in a calorimeter to steam at 100 degrees Celsius. (8 marks)

Given

Specific heat capacity of ice =2100 J kg^{-1} $^0C^{-1}$

Specific heat capacity of water=4186 J kg^{-1} $^0C^{-1}$

Latent heat of fusion of ice = 3.35×10^5 J kg^{-1}

Latent heat of fusion of steam = 2.5×10^6 J kg^{-1}

Q.18 a) State Hooke`s Law and define Young`s Modules of elasticity. (3 marks)

b) State the principle and explain the working of Sextant. (7 marks)

Q.19 a) An optical fiber made up the glass with refractive index $n_1 = 1.5$ which is surrounded by another glass of refractive index n_2. Find the refractive index n_2 of the cladding such that the critical angle between the two cladding is 80°. (3 marks)

b) State Bernoulli's theorem and explain its application in detail. (7 marks)

Q.20 a) Explain with neat block diagram, principle, construction and working of Echo sounder. (7 marks)

b) Calculate the Reynolds number if a liquid of viscosity 0.5 Ns/m2 and relative density of 500 Kg/m3 through a 10 mm pipe flows with a Velocity of 3 m/s. (3 marks)

Q.21. a) Define Mechanical advantage, velocity ratio and efficiency of a differential pulley.

(6 marks)

b) A body oscillates with a simple harmonic motion along x-axis. Its displacement varies with time according to $x = 8 \sin (\pi t + \pi/4)$

Where t is in second and angle is in radians.

a) Determine amplitude, frequency and period of motion.

b) Calculate velocity and acceleration of the body at any time 't'.

(4 marks)

Q.22 a) Give some e.g. of alloys and explain the properties of alloys are different from those of constituent metals. (7 marks)

b) A hospital uses an ultrasonic scanner to locate tumours in a tissue. What is the wavelength of sound in a tissue, in which the speed of sound is 1.7 m/s and the operating frequency of the scanner is 4.2 MHz. (3 marks)

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