

Indian Maritime University
(A Central University, Govt of India)
End Semester Examinations – June 2023

Programme Name: DNS

Semester: 1

Subject Code: UD11T5102

Subject Name: APPLIED SCIENCE

Date: 21.06.2023

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 respective section
- (iii) Tables (Steam/Log/Nautical Almanac etc.) that can be used
- (iv) Any other tables/charts to be used.
- (v) Non- programmable Scientific Calculator is permitted.

Section A
Answer all the questions

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

1. Newton's first law of motion gives the concept of

(a) Work (b) Force (c) Inertia (d) Energy

2. The Moment of Inertia of Triangle of base **b** and height **h** with respect to its base would

(a) $bh^3/8$ (b) $bh^3/12$ (c) $bh^3/24$ (d) $bh^3/6$

3. If a spring of mass 20 kg has a spring constant 5 N/m, then its time period is

- a) 4 seconds
- b) 2 seconds
- c) 2π seconds
- d) 4π seconds

4. Which of the following quantity is kept constant in Boyle's law

- (a) Gas mass only (b) Gas temperature only
- (c) Gas mass & gas temperature (d) Gas mass & gas pressure

5. Total internal reflection is the principle behind the sparkling of diamonds.

True / False

6. Simple harmonic motion with a constant amplitude & period and no external influences is known as

- (a) Damped Oscillation (b) Undamped or free oscillation
(c) Forced Oscillation (d) All of the above

7. Suppose P,V&T denote the gas's pressure ,volume & temperature in that case the correct representation of Charlee's law is

- (a) $V \propto P$ (at constant P) (b) Inversely proportional to T (at constant P)
(c) $PV=nRT$ (d) None of the above

8. An active radar system transmits a signal that is reflected back to the receiver.

True / False

9. Radar works on the principle of _____ of Electromagnetic waves.

- a) Refraction b) Diffraction
c) Total internal reflection d) Reflection

10. Out of the following, which is not an essential element of a communication system?

- (a) Transmitter (b) Radar (c) Receiver (d) Communication channel

Section B

Answer all the questions

Five Questions of 02 Marks each

11. State universal law of gravitation

12. Write a relation connecting Celsius, kelvin and Fahrenheit scale.

13. State total internal reflection and Critical angle

14. Define real and apparent expansion of a liquid

15. Define what are transducers?

Section C

Answer any five out of seven question (5x10 marks = 50 marks)

16. (a) Explain the concept of Gyroscope, its precession and gyro inertia

(b) State and derive equation of parallel Axis theorem

17. a) Explain basic formation of "superheated steam", its applications, Hazards

and precautions.

(5 marks)

(b) Explain the working of astronomical telescope with the help of suitable diagram. (5 marks)

18. (a) Define damped, un-damped oscillations and forced oscillations. (5m)

(b) A piece of metal of mass 400 gram and of specific heat $126 \text{ J/kg } ^\circ\text{C}$ heated to $150 ^\circ\text{C}$ is dropped in 80 gram of water at 20°C in a calorimeter of 150 gram and of specific heat capacity $400 \text{ J/kg } ^\circ\text{C}$. Find the final temperature of the mixture. Specific heat for water is $4200 \text{ J/kg } ^\circ\text{C}$. (5m)

19. (a) Describe and draw sketch of a sextant showing the arrangement of mirrors (5 m)

(b) An object is placed at a distance of 6cm from a convex mirror of a 12cm focal length. What is the position and nature of the image? (5 m)

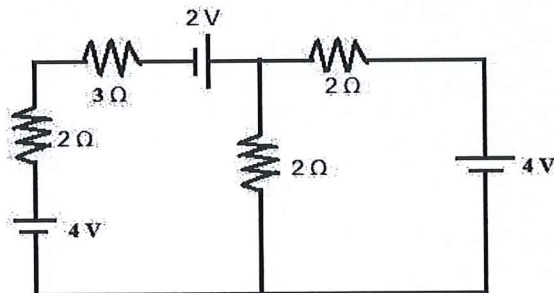
20. (a) What do you mean by resistance? How does temperature affect the resistance? (5m)

(b) A particle performing S.H.M has a period of 6s and amplitude of 8cm. the particle starts from the mean position and move towards the positive extremity. Find the Displacement, Velocity, and acceleration, 0.5 s after start. (5m)

21 (a) Explain the construction and working of super heterodyne receivers with block diagram. (5m)

(b) Compare between Electric circuit and Magnetic circuit. (5m)

22(a) Using Node method, find the current in the 3Ω resistance shown in figure below (5m)



b) Explain the neat diagram working of Radar Transmitter? (5m)
