INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)

End Semester Examination- September 2020

Diploma In Nautical Science

Semester-I

APPLIED SCIENCES (UD11T4102)

Date: 22-09-2020 Max Marks: 70

Time: 2 Hrs Pass Marks: 35

Part –A (Physics)

Answer any FOUR out of FIVE Questions.
All Questions carry equal marks.

1. (a) State the principle of conservation of energy. Show that the sum of total energy of a body falling freely under gravity remains constant at all heights from the ground. (5)

   (b) A constant torque of magnitude 5000 N-m acting on a body increases its angular velocity from 2 rad/s to 20 rad/s in 9 secs. Calculate the moment of inertia of the body about the axis of rotation. (5)

2. (a) Explain the different modes of heat transfer. (5)

   (b) A copper block of 1.5kg is heated in a furnace to a temperature of 400°C and is placed over a large ice block. What can be the maximum amount of ice that has melted? (Given: Specific heat of copper =0.39 J/g ºC. Latent heat of fusion of ice = 335 J/gm) (5)

3. (a) Derive an expression for time period of a simple pendulum. (5)

   (b) A body oscillates with a simple harmonic motion along x-axis. Its displacement varies with time according to the equation

$$x = 10\cos\left(20\pi t + \frac{\pi}{3}\right)$$

where t is in second, angle is in radian and displacement is in meter. Calculate amplitude, angular frequency, frequency, time period and initial phase. (5)

4. (a) Explain how different factors affect the velocity of sound in air. (5)

   (b) A policeman blows a whistle of frequency 400 Hz as a car speed past him with a velocity of 54 km/hr. Find the change in frequency as heard by the driver of the car as he passes the policeman. Velocity of sound is 350 m/s. (5)

5. (a) What do you mean by total internal reflection? Give the conditions for total internal reflection. (5)

(b) An object is placed at a distance of 40 cm on the principal axis of a concave mirror of radius of curvature 30 cm. By how much does the image move if the object is shifted towards the mirror through 15 cm. (5)

Part – B
(ELECTRICITY AND ELECTRONICS)

Answer any THREE out of FOUR Questions. All Questions carry equal marks.

6. (a) Define
   1. ampere
   2. watt
   3. henry
   4. farad
   5. temperature coefficient of resistance (5)

(b) An electrical heater is fitted with a control marked Low, medium and High. The heating element consists of two similar coils, which are connected in parallel for High and in series for Low. Only one coil is used for Medium. If the plate when set at High is rated at 1kW on 220V, find the power rating when the control is set at Low. (5)

7. (a)Explain principle, construction and working of A.C. generator. (5)

(b)A transformer has an efficiency of 95%. It works at 5 kilowatt and 100 volt. If the secondary voltage is 230 volts, calculate the primary and secondary currents. (5)

8. (a)Explain working of RADAR with the help of a neat labelled diagram. (5)

(b)Write any five safe working practices while handling electrical energy. (5)

9. Write short notes on any TWO of the following THREE
   (a) Radio receiver
   (b) Electromagnetic waves
   (c) Temperature transducer (5 x 2=10)

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