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INDIAN MARITIME UNIVERSITY
(A Central University, Government of India)

December 2016 End Semester Examinations
B.Sc. (Nautical Science)- First Semester (2013 – 15 batches)

Nautical Physics - I (UG21T2105)

Date : 23.12.2016

Maximum Marks: 70

Time: 3 Hrs

Pass Marks : 35

Note: Answer any seven questions. All questions carries equal marks. (7 x 10 = 70 marks)

1. a) With the help of neat sketch, explain the differential pulley and derive an expression for its efficiency. (5 marks)
- b) A body whose mass is 6 kg is acted on by a force which changes its velocity from 3 m/s to 5 m/s. find the impulse of the force. if the force is acted for 2 seconds, find the force in newton. (5 marks)
2. a) Explain the term "Gyro inertia". (5 marks)
- b) Compute the rotational Kinetic energy of a 2 kg wheel rotating at 6 revolutions per second, if the radius of gyration of the wheel is 0.22 m. (5 marks)
3. a) Define Mechanical advantage, velocity ratio and efficiency as applied to machines. Derive the relation between them. (5 marks)
- b) Calculate the viscous force on a ball of radius 1 mm moving through a liquid of viscosity 0.2 Nsm^{-2} at a speed of 0.07 ms^{-1} . (5 marks)
4. a) State and prove the Bernoulli's equation for the liquid of flow. (5 marks)
- b) A wire of diameter 2.5 mm is stretched by a force of 980 N. if the young modulus of the wire is $12.5 \times 10^{10} \text{ Nm}^{-2}$, find the percentage increase in the length of the wire. (5 marks)
5. a) Explain Streamline flow and turbulent flow (5 marks)
- b) State the laws of floatation. (5 marks)
6. a) Derive the formula for rate of flow of the water in venturimeter. (5 marks)
- b) Determine the height to which water will rise in a capillary tube of $0.5 \times 10^{-3} \text{ m}$ diameter. Given for water, surface tension is 0.074 Nm^{-1} (5 marks)

7. a) Define the following (5 marks)
- i) Viscosity ii) Reynolds number
- b) For cylindrical pipes, Reynolds number is nearly 2000. if the diameter of a pipe is 2 cm and water flows through it. Determine the velocity of flow.
Take η for water = 10^{-3}Nsm^{-2} (5 marks)
8. a) Explain anomalous expansion of water. (5 marks)
- b) Why the cargo is kept at the bottom of the ship. (5 marks)
9. a) Explain the different modes of heat transfer. (5 marks)
- b) State and explain Hooke's law. (5 marks)
