LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**B.Sc.** DEGREE EXAMINATION – **PHYSICS**

SECOND SEMESTER – NOVEMBER 2012

# PH 2503 - MECHANICS

Date : 07/11/2012 Dept. No. Max. : 100 Marks

Time : 1:00 - 4:00

**PART –A**

**Answer ALL questons: (10x2=20Marks )**

1. State the law of conservation of angular momentum . Give an example .

2. What is a rigid body?

3. Distinguish between couple and Torque with an example.

4. A ship of mass 2x104 kg is displaced .A load of 30x106 kg moved across 50 metres across the

deck makes the ship tilt through **/100 radians.** Calculate the metacentric height.

5. What is the molecular weight of a gas which diffuses 1/50 as fast as hydrogen?

6. State Toricelli’s theorem.

7. Draw a neat diagram of a venturimeter.

8. State D’Alembert’s principle.

9. State and explain Kepler’s **2nd** law of planetary motion.

10. Explain weightlessness in a moving lift.

**PART-B**

**Answer any FOUR questions: (4x7.5=30Marks)**

11. Explain how the oscillations of a compound pendulum can be used to determine the acceleration

due to gravity in the laboratory .

12. a) What is meant by centre of pressure ? (3marks)

b) Calculate the centre of pressure of a rectangular lamina of sides a and b. (4.5marks)

13. State and prove Bernoulli’s theorem. (2+5.5 marks)

14. Discuss the motion of a simple pendulum from Langrange’s equations.

15. Distinguish between orbital and escape velocity. (4marks)

Calculate the escape velocity of a body on the earth from the given the following data: (3.5 marks)

(Acceleration due to gravity g = 9.8 ms-2 ; radius of earth RE = 6400 km)

**PART-C**

Answer **any FOUR** questions: (4X12.5 =50MARKS)

16. (a) Show that the time period of a torsion pendulum is given by **2 I/C. (**8marks)

(b) A thin uniform rod of length 1.2meter and breadth 0.12m is made to swing in a vertical plane

about an axis thro’ a point A at a distance x from the centre of gravity. Find the value of x if the

period of oscillation is a minimum. (4.5marks)

17. a) Draw a diagram of a floating body to show meta centre and metacentric height. (3 marks)

b) Discuss the stability of floating bodies with respect to the above terms. (3marks)

c) Explain how the metacentric height of a ship be determined . (6.5marks)

18. a) State and explain the equation of continuity. (5marks)

b) Derive an expression for the terms potential head and kinetic head. (4marks)

c) Water flowing with a velocity of 3m/s in a 4cm diameter pipe enters a narrow pipe having a

diameter of only 2 cm. Calculate the velocity in the narrow pipe. (3.5marks)

19. a) Define with an example the terms. (6 marks)

i) degee of freedom

ii) constraints

iii) holonomic and non holonomic systems

b)Derive Newton’s equation for force from the Lagrangian. (6.5 marks)

20. a) Explain gravitational potential. Hence derive an expression for gravitational potential at a

point, distant r from a body of mass m. (3+5 marks)

b) Assuming the earth to be a homogenous sphere and using the laws of gravity estimate the

density of the earth. G=6.6X10-11 N( m/Kg )2  and radius of the earth is 6400 km. (4.5marks)

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