



MAR IVANIOS COLLEGE (AUTONOMOUS)
THIRUVANANTHAPURAM

Reg. No. :.....

Name :.....

First Semester B.Sc. Degree Examination, November 2016

First Degree Programme under CBCSS

Complementary Course: Physics – I (for Chemistry)

AUPY131.2b: Rotational Dynamics and Properties of Matter

(Common for **Regular** – 2016 Admn. and **Improvement** – 2015 Admn.)

Time: 3 Hours

Max. Marks: 80

SECTION – A

Answer ALL questions in a word or one or two sentences.

1. State the perpendicular axis theorem of moment of inertia.
2. What is the principle of a gyroscope ?
3. What do you mean by equivalent simple pendulum of a compound pendulum ?
4. Differentiate between longitudinal waves and transverse waves.
5. Bending of a centrally loaded beam is said to be non – uniform. Why ?
6. Define the term torsional rigidity.
7. How does viscosity of a liquid vary with temperature ?
8. What is a torsion pendulum ?
9. The mass of a fly wheel is concentrated at the rim. Why ?
10. What do you mean by resonance ?

(10 × 1 = 10 Marks)

SECTION – B

Answer any EIGHT questions, not exceeding a paragraph.

11. Large beams have I – section. Why ?
12. Find the radius of gyration of a circular disc of mass M and radius R rotating about a diameter.
13. Find the reduced mass of two tiny beads of mass m_1 and m_2 separated by a distance r.

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14. What do you mean by bending moment of a beam ?
15. Explain what is static torsion. How does rigidity modulus affect it ?
16. Write short note on corrections applied to Poiseuille's formula.
17. In a river, water flow is always turbulent. Why ?
18. Define shear of an elastic cylinder. What is its relation with twist ?
19. Small liquid drops are spherical but large drops flatten. Why ?
20. Give the condition for equilibrium of a liquid drop on surface of another liquid.
21. What are the advantages of Jaeger's method of determining surface tension ?
22. What is the principle of an Ostwald's viscometer ?

(8 × 2 = 16 Marks)

SECTION – C

*Short essay type / Problems : Answer any **SIX** questions.*

23. A thin annular disc of mass 10 kg has outer diameter 50 cm and inner diameter 10 cm. Find the moment of inertia about axis passing through the outer rim and perpendicular to its plane.
24. Calculate the force constant of a CO molecule if its vibrational frequency is 6×10^{14} Hz.
25. What couple must be applied to a 1m long wire of diameter 3mm to twist one end through 30° with the other end fixed ? Given rigidity modulus = 5×10^{10} N / m²
26. Find the work done in spraying a liquid drop of radius 1mm into 1000 droplets of equal size, if surface tension of liquid = 72×10^{-3} N / m
27. Find the terminal velocity of a rain drop of radius 0.3 mm. Given coefficient of viscosity of air = 1.83×10^{-5} Nsm⁻². Density of air = 1.3 kg / m³ and density of water = 103 kg / m³, g = 9.8 m / s².
28. A ring shaped fly wheel of mass 50 kg and radius 20 cm rotates at the rate of 300 rpm. Calculate the kinetic energy.
29. Calculate average energy per unit volume of a plain progressive wave of frequency 200 Hz and amplitude 5 cm if density of the medium = 500 kg / m³.
30. Find the pressure difference to be maintained between the ends of a horizontal tube of radius 1 mm and length 50 cm so that water flows at the rate of 30cc per minute. Given viscosity of water = 10^{-3} Nsm⁻².
31. Show that a hollow cylinder has higher couple per unit twist than a solid cylinder of same mass and material.

(6 × 4 = 24 Marks)

SECTION – D

Long essay type : Answer any TWO questions.

32. Find an expression for excess of pressure on a curved liquid surface. Apply it to a spherical drop, a spherical bubble and force between two parallel plates separated by a thin film.
33. Define moment of inertia of a body. Calculate the moment of inertia of the following.
 - i). Solid sphere about a tangential axis.
 - ii). Solid cylinder about axis perpendicular to length and passing through geometric centre.
34. Discuss the bending of a loaded cantilever. Describe an experimental method of determination of Young's modulus using a cantilever.
35. What is a compound pendulum ? Derive the expression for its period. Show that there exists four collinear points on a compound pendulum having the same period.

(2 × 15 = 30 Marks)

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