

**B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MAY 2016****Second Semester**

Core Course—MECHANICS AND PROPERTIES OF MATTER

Common for the programmes B.Sc. Physics (Model I), B.Sc. Physics (Model II),  
B.Sc. Physics EEM, B.Sc. Physics Instrumentation

(2013 Admission onwards)

Time : Three Hours

Maximum Marks : 60

*Candidates can use non-Programmable Scientific Calculators.***Part A (Very Short Answer Questions)***Answer all questions.  
Each question carries 1 mark.*

1. Explain the term "radius of gyration."
2. State parallel axis theorem.
3. Explain critical damping.
4. What meant by beat frequency ?
5. Give the significance of Poisson's ratio.
6. Bring out the difference between uniform and non-uniform bending.
7. How do you account for surface energy ?
8. What is meant by stream line motion ?

(8 × 1 = 8)

**Part B***Answer any six questions.  
Each question carries 2 marks.*

9. What is a compound pendulum ? Explain.
10. Explain the effect of finite arc of swing on the period of Kater's pendulum.
11. Differentiate between centripetal and centrifugal forces with examples.
12. Obtain the expression for a progressive wave.
13. Bring out damped and forced oscillations.
14. Discuss Hook's law.
15. Illustrate non-uniform bending.
16. Arrive at the relation between surface tension and surface energy.

**Turn over**

17. Why Poissulle's formula fail in the case of wide bore ? Explain.
18. State and explain the uses of lubricants.

(6 × 2 = 12)

### Part C

*Answer any four questions.  
Each question carries 4 marks.*

19. Bringout the inter-changability of the centers of suspension and oscillation of a compound pendulum.
20. A fly wheel of mass 500 kg and 2 m diameter makes 500 revolutions per minute. Assuming the mass to be concentrated at the rim, calculate the angular velocity, the energy and moment of inertia of the flywheel.
21. The amplitude of a damped harmonic oscillator is reduced to half its undamped value in 200 seconds. If its natural frequency is  $\pi$  radians per second what is its relaxation time and quality factor ?
22. A source of sound has frequency 480 Hz and an amplitude 0.28 cm. The velocity of sound in air is 338 m/s and the density of air is 1.293 gm/litre. Find the rate of flow of energy per unit area of cross-section.
23. A cantilever of length 60cm is depressed by 20 mm at the loaded end. What is the depression at a distance 40 cm from the fixed end ?
24. Water is escaping from a cistern by way of a horizontal capillary tube 10cm long and 0.4 mm diameter at a distance of 50 cm below the surface of water in the cistern. Calculate the rate at which the water is escaping.

(4 × 4 = 16)

### Part D

*Answer any two questions.  
Each question carries 12 marks.*

25. Give the theory of Kater's pendulum and find an expression for the acceleration due to gravity in terms of two nearly equal periods of oscillation about the two parallel knife edges. Discuss the sources of errors in an experimental determination of 'g'.
26. Set up the differential equation for a damped harmonic oscillator and solve it for different damping.
27. Deduce the relation for the couple per unit twist in the case of a cylindrical wire.
28. Derive the formula for the flow of a liquid through a capillary tube.

(2 × 12 = 24)