TB171450D

Reg. No.....

Name.....

B. Sc. DEGREE (C.B.C.S.S) EXAMINATION, OCTOBER 2018
(2015 & 2016 Admissions Supplementary & 2017 Admissions Improvement / Supplementary)
SEMESTER I - COMPLEMENTARY COURSE (PHYSICS)
PH1CC1TB - PROPERTIES OF MATTER, MECHANICS AND PARTICLE PHYSICS (FOR CHEMISTRY)

Time: Three Hours **Maximum Marks: 60**

PART A

I. Answer all questions. Each question carries 1 mark

1. What is meant by bulk modulus of a material?
2. What is elastic after effect?
3. Explain the physical significance of moment of inertia.
4. Draw the variation of K.E and P.E of harmonic oscillator with displacement.
5. What is hypercharge of elementary particles?

(5 × 1 = 5)

PART B

II. Answer any five questions. Each question carries 2 marks

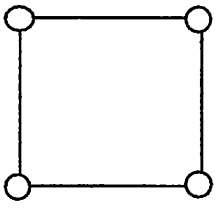
6. Describe the form of stress-strain graph for a steel wire.
7. Explain why a hollow cylinder is stronger than a solid cylinder of the same length, mass and material.
8. Derive the relation between linear strain and volume strain of a body.
9. Prove that torque applied on a rotating body is equal to the rate of change of angular momentum.
10. Derive the expression for moment of inertia of circular disc of mass M and radius R about an axis passing through its centre and perpendicular to its plane.
11. Show that the phase relation between displacement and velocity of a harmonic oscillator is $\frac{\pi}{2}$
12. Discuss the effect of damping on the velocity of harmonic oscillator.
13. Write a short note on fundamental interactions in nature.

(5 × 2 = 10)

PART C

III. Answer any five questions. Each question carries 5 marks

14. A cube of aluminium of side 20 cm is subjected to a shearing force of 10 N. The top surface of the cube is displaced by 0.02 cm with respect to the bottom. Calculate the shearing stress, shearing strain and modulus of rigidity.
15. One end of a steel wire of length 0.3 m and radius 4×10^{-3} m is fixed. If the work done in twisting the free end of the wire is 3.85×10^{-2} J, calculate the angle through which the wire is twisted. Given rigidity modulus of the steel as 8.075×10^{11} Nm^{-2}.
16. Four solid spheres A, B, C and D, each of mass m and radius a are placed with their centres at the four corners of a square of side b (shown in figure). Prove that moment of inertia about one side of square is $\frac{2}{5}m(4a^2 + 5b^2)$.



17. A wheel rotating at a speed of 1200 rpm about its axis is brought to rest by applying a constant torque for 25 seconds. Find the angular deceleration and angular velocity at 18 seconds after the application of torque.
18. A square lamina has a moment of inertia of 100Kg-m^2 about its diagonal. What is its moment of inertia about an axis through its centre and perpendicular to the plane of lamina?
19. A simple harmonic motion is given as $x = 0.2 \sin\left[\frac{4\pi t}{3} + \frac{\pi}{3}\right]$m. Find its (i) displacement (ii) velocity and (iii) acceleration 5s after the particle has crossed its mean position.
20. In damped oscillations, the amplitude of oscillation is reduced to one-third of its initial value of 9cm at the end of 100 oscillations. What will be its amplitude of oscillations in cm when it completes 200 oscillations?
21. Using the law of conservation of lepton numbers, find which of the following reactions is possible.
    (a) $p + \overline{\vartheta_e} \rightarrow n + \mu^+$ (b) $p + \overline{\vartheta_e} \rightarrow n + e^+$

(5 × 5 = 25)

PART D

IV. Answer any two questions. Each question carries 10 marks

22. Derive the expression for bending moment of a beam.
23. Explain moment of inertia. Also define radius of gyration. State and prove parallel and perpendicular axes theorems.
24. With a neat diagram, explain flywheel in brief. Also describe an experiment to determine the moment of inertia of flywheel and derive the expressions for it.
25. What is meant by driven harmonic oscillations? Deduce the differential equation of driven harmonic oscillator. Discuss the amplitude resonance and sharpness of resonance.

(2 × 10 = 20)