E 8923 (Pages : 2) Reg. No.....

Name.....

# B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, NOVEMBER 2019

**First Semester**

Complementary Course—Physics

PROPERTIES OF MATTER, MECHANICS AND PARTICLE PHYSICS

(For the subjects Chemistry and Geology)

[2013–2016 Admissions]

Time : Three Hours Maximum Marks : 60

*Candidates can use Clark's tables and Scientific Non-programmable Calculators.*

## Part A (Very Short Answer Type Questions)

*Answer* **all** *questions briefly.*
*Each question carries* 1 *mark.*

1. What do you mean by Elastic fatigue?
2. What is meant by Poisson's ratio?
3. What is bending moment?
4. Which terms in the moment of inertia tensor vanish when principal axes are referred?
5. What is a flywheel?
6. Define SHM and give one example.
7. What is Antiparticle?
8. What are forced oscillations?

(8 × 1 = 8)

## Part B

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

9. Define Torsion rigidity of a wire. How is it related to modulus of elasticity?
10. Distinguish between Uniform and Non-uniform bending.
11. Distinguish between Angle of twist and Angle of shear.
12. Explain conservation of angular momentum. What is its importance?
13. State and explain perpendicular axes theorem.
14. What is resonance? State and explain the conditions for resonance.
15. What is meant by gauge particles? Explain in brief.

**Turn over**

16. A body executes SHM such that its velocity at mean position is 1 m/s, and acceleration at one extremity is 1.5 $m/s^2$. Calculate the time period of oscillation.

17. Explain the particle quantum numbers and their significance.

18. If the moment of inertia of a sphere about a diameter is $2MR^2 / 5$, find its moment of inertia about a tangent.

(6 × 2 = 12)

## Part C

*Answer any* **four** *questions.*

*Each question carries* 4 *marks.*

19. A wire 0.3 mm, in diameter elongates by 1 mm, when stretched by a force of 0.3 kg.wt. and twists through 1 radian when equal and opposite torques of $145 \times 10^{-7}$ Nm are applied at its ends. Find Poisson's ratio for the wire.

20. A cylindrical rod of length 1 m. and radius 1 cm. is uniformly bent into a circular arc of radius 10 m. Calculate the bending moment. Given $y = 9 \times 10^{10}$ $N/m^2$.

21. A fly wheel of mass 10 kg and radius of gyration 20 cm is rotating with angular velocity 10 rotations per minute. Calculate its angular momentum.

22. A cantilever of length 0.5 m has a depression of 15 mm at its free end. Calculate the depression at a distance of 0.3 m from the fixed end.

23. A body of mass 6 kg acquires an acceleration of 10 $rad/s^2$ by an applied torque of 2 Nm. Calculate its moment of inertia and radius of gyration.

24. A particle executes simple harmonic motion of period 3.14*s* and amplitude 5 cm. Calculate its maximum velocity and maximum acceleration.

(4 × 4 = 16)

## Part D

*Answer any* **two** *questions.*

*Each question carries* 12 *marks.*

25. With necessary theory, describe how you will determine the rigidity modulus of a rod by static torsion method.

26. Derive the moment of inertia of a thin uniform rod about an axis perpendicular to its length and passing through : (i) its centre of mass ; and (ii) one end.

27. What do you mean by a simple harmonic oscillator ? Derive its differential equation and find the expression for its velocity, displacement and period.

28. What are the fundamental interactions in nature? Give examples. Explain the quark model.

(2 × 12 = 24)