E 2575 (Pages : 2) Reg. No.....

Name.....

B.Sc. DEGREE (CBCSS) EXAMINATION, NOVEMBER 2021

First Semester

Complementary Course—Physics

PROPERTIES OF MATTER, MECHANICS AND FOURIER ANALYSIS

(For the subject Mathematics Model I and Statistics)

[2013 to 2016 Admissions]

Time : Three Hours Maximum : 60 Marks

Candidates can use Clark's tables and scientific non-programmable calculators.

Part A

Answer **all** *questions.*
Each question carries 1 *mark.*
Fill up the blanks using appropriate words.

1. Liquid and gases are ——— elastic.
2. Twisting couple per unit angular twist is called ——— rigidity.
3. Cantilever is a beam fixed horizontally at one end and ——— at the other end.
4. The linear momentum of a body is the product of its mass and ——— velocity.
5. Moment of inertia is a ——— quantity.
6. The moment of inertia of a solid sphere about a tangent is ———.
7. Force constant is the restoring force per unit ———.
8. The Fourier series expansion gives no assurance for its velocity ——— the basic interval.

$(8 \times 1 = 8)$

Part B

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

9. Glass is more elastic than rubber. How ?
10. What is meant by restoring couple ?
11. Explain the concept of non-uniform bending.
12. What is a cantilever ?
13. Define torque.
14. What is meant by conservation of angular momentum ?

Turn over

15. State the uses of flywheel.
16. Write down the differentiate equation for forced oscillations.
17. Explain resonance.
18. What are Fourier coefficients ?

(6 × 2 = 12)

Part C

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

19. What forces is required to stretch a steel wire 0.5 $cm.^2$ in cross-section to double its length ? Given Young's modulus for steel is 2×10^{11} $Nm.^{-2}$
20. State and prove the relation between Y, n and σ.
21. Calculate the moment of inertia of solid cylinder of mass 2 kg., radius 10 cm. and length 24 cm. about an axis perpendicular to its length and passing through one of its ends.
22. Determine the moment of inertia of earth, assuming it to be a uniform sphere of radius 6400 km. and mass 6×10^{10} kg.
23. A simple harmonic oscillator is characterized by $y = a \cos \omega t$. Calculate the displacement at which kinetic energy is equal to its potential energy.
24. If the resonant frequency of acoustic system is 280 Hz and half power frequencies are 200 Hz and 360 Hz respectively, calculate the quality factor.

(4 × 4 = 16)

Part D

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

25. What are torsional oscillations ? Derive an expression for the twisting couple per unit angular twist for a hollow cylinder.
26. Determine the moment of inertia of a circular disc about an axis through its center perpendicular to its plane.
27. Explain simple harmonic motion and discuss its characteristics.
28. What do you mean by damping ? Prove that the damping force is independent of acceleration or displacement and is proportional to velocity.

(2 × 12 = 24)