E 7821 (Pages : 2) Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, NOVEMBER 2017

First Semester

Complementary Course—Physics—PROPERTIES OF MATTER, MECHANICS AND FOURIER ANALYSIS

(For the Subject Mathematics Model I and Statistics)

[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 Questions)

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

1. What are elastic constants ?
2. State the limiting values of Poisson's ratio.
3. Define shearing strain.
4. What is neutral surface ?
5. State perpendicular axis theorem.
6. Write the expression for the MI of a solid sphere about its tangent.
7. What is resonance for forced oscillations ?
8. What are Fourier co-efficients ?

(8 × 1 = 8)

Part B (Short Answer Questions)

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

9. Explain flexural rigidity.
10. Why girders are of I shape ? Explain.
11. What makes a beam different from a cantilever?
12. Define torsional oscillations with an example.
13. Explain uniform and non uniform bending.

Turn over

14. Define radius of gyration. How is it different from center of gravity ?
15. State and explain parallel axis theorem.
16. Obtain the MI of a circular disc about diameter.
17. Explain the oscillations of a simple pendulum as an example of SHM.
18. Give the Fourier analysis of saw tooth wave.

(6 × 2 = 12)

Part C (Derivatives/Problems/Short Essays)

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

19. A wire of length 15 m and diameter 4 mm elongates 0.3 mm when stretched by a weight of 2.2 kg. Calculate the Young's modulus of the material of the wire.
20. A torsion pendulum with a wire of length 1 m, diameter 1.22 mm and rigidity modulus 80 G Pa oscillates with a period of 1.25 seconds. Find the moment of inertia of the suspended body about the axis of suspension.
21. A cantilever of length 60 cm is depressed by 20 mm at the loaded end. What is the depression at a distance 40 cm from the fixed end ?
22. Calculate the moment of inertia of a ring of mass 200 gm and radius 20 cm about an axis passing through its centre and perpendicular to its plane about its diameter.
23. Find the ratio of length to radius of a right solid cylinder if its moment of inertia about its axis is equal to its moment of inertia about its perpendicular bisector.
24. The amplitude of a SH oscillator is doubled. How does this affect the time period, total energy and maximum velocity of the oscillator ?

(4 × 4 = 16)

Part D (Essay Type Questions)

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

25. Describe with theory the static torsion method of determining the rigidity modulus of the material of a rod.
26. Discuss an experiment to determine the Young's modulus of the given material using it as a cantilever with necessary theory.
27. Derive an expression for the moment of inertia of a solid sphere about its diameter and tangent.
28. Setup the differential equation for forced harmonic oscillations and arrive at solutions in different cases.

(2 × 12 = 24)