

**B. Sc. DEGREE END SEMESTER EXAMINATION - OCTOBER 2019****SEMESTER – 1: PHYSICS (COMPLEMENTARY COURSE FOR MATHEMATICS)****COURSE: 15U1CPPHY1: PROPERTIES OF MATTER, MECHANICS AND FOURIER ANALYSIS***(Common for Improvement 2018/ Supplementary 2018/2017/2016 /2015 admission)*

Time: Three Hours

Max. Marks: 60

**PART A*****Answer all questions, 1mark each (total 8 marks)***

1. What is Hooke's law? Name the three moduli of elasticity.
2. What do you mean by bending moment of a beam?
3. Explain the term torsional couple?
4. State perpendicular axis theorem.
5. Define simple harmonic motion, explaining the meaning of period, amplitude and phase.
6. What are forced oscillations and resonance?
7. Distinguish between periodic and oscillatory motions?
8. State the conditions for the applicability of Fourier theorem. (1 x 8 = 8)

**PART B*****Answer any six questions, 2 marks each (Total 12 marks)***

9. Discuss the terms stress and strain. Show that in deforming a body the work done per unit volume is  $\frac{1}{2} \times \text{stress} \times \text{strain}$ .
10. Distinguish between uniform and non-uniform bending.
11. What is a flywheel? Discuss its applications.
12. Derive an expression for the moment of inertia of a ring.
13. Discuss the law of conservation of angular momentum.
14. Give the expressions for the velocity and acceleration of a simple harmonic oscillator.
15. Set up differential equation for a simple harmonic oscillator.
16. Define symmetry conditions in functions. (2 x 6 = 12)

**PART C*****Answer any 4 questions, 5 marks each (Total 20 marks)***

17. A wire 3m long and  $0.625\text{cm}^2$  in cross section is found to stretch by 0.3 cm under a tension of 1200 Kg. What is the Young's modulus of the material of the wire?
18. Calculate the period of a torsion pendulum consisting of a disc of mass 1.5Kg and radius 15cm suspended by a wire of length 80cm and radius 0.7mm. Rigidity modulus of the material of the wire is  $13.6 \times 10^{10} \text{ N/m}^2$ .
19. A Solid cylinder has a mass of 2Kg and length 10cm. If the radius of the cylinder is 2cm calculate its moment of inertia about the main axis.

20. Derive an expression for the moment of inertia of sphere about its diameter.
21. Calculate the ratio of maximum acceleration to the maximum velocity of a particle performing SHM.
22. A body of mass 200gm is executing SHM along a straight line. The velocities of the body at distances 6cm and 12cm from the mean positions are 1m/s and 0.5m/s respectively. Find the time period and frequency. (5 x 4 = 20)

**PART D**

***Answer any two, 10 marks each (Total 20 marks)***

23. Discuss with necessary theory the determination of the rigidity modulus of the material of a rod using static torsion apparatus.
24. Briefly discuss the theory of cantilever- uniform bending.
25. Define simple harmonic motion. Also derive expressions for kinetic and potential energies and show that the total energy is a constant. Also plot the variations of energies with displacement.
26. Deduce the expressions for the Fourier coefficients.

(10 x 2 = 20)

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