Reg. No:.............................

Name:..............................

B. Sc. DEGREE (C.B.C.S.S) EXAMINATION, OCTOBER 2018
(2017 Admission Improvement / Supplementary and 2015 & 2016 Admission Supplementary)
SEMESTER I - COMPLEMENTARY COURSE (PHYSICS)
PH1CM1TB - PROPERTIES OF MATTER, MECHANICS AND FOURIER ANALYSIS
(For Mathematics)

Time: Three Hours   Maximum Marks: 60

PART A

I.   Answer all questions. Each question carries 1 mark

1. What is meant by elastic fatigue?
2. What is the yield point in stress –strain graph?
3. What is the physical significance of moment of inertia?
4. Define SHM with one example.
5. What is meant by odd and even functions?

(5 × 1=5)

PART B

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

6. Derive the expression for work done per unit volume in the case of volume strain.
7. What are I section girders?
8. Distinguish between angle of twist and angle of shear.
9. Derive the relation connecting torque and angular acceleration.
10. Obtain an expression for moment of inertia of a thin circular ring about a diameter.
11. State Dirichlet's conditions.
12. Find the amplitude, time period, frequency and initial phase of a harmonic oscillator described by the equation $x = 5 \sin (100\pi t + \pi/3)$.
13. What is sharpness of resonance? Explain the effect of damping on sharpness of resonance.

(5 × 2=10)

PART C

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

14. What force is required to stretch a wire 1sq.cm in cross-section to double its length? $Y=2\times10^{11} N/m^2$.
15. A cantilever shows a depression of 1cm at the loaded end. What is the depression at its midpoint?
16. A cube of aluminium of side 10cm is subjected to a shearing force of 10 N. The top surface of the cube is displaced by 0.01cm with respect to the bottom. Calculate the shearing stress, shearing strain and modulus of rigidity.
17. A wheel of mass 5Kg and radius of gyration 40cm is rotating at 210rpm. Find the moment of inertia and kinetic energy in MKS unit.
18. Four spheres each of diameter 2a and mass m are placed with their centres on the four corners of a square of side b. Calculate the moment of inertia of the system about any side of the square.

19. A body is executing SHM along a straight line. When the displacement is one-fourth of the amplitude, calculate its kinetic and potential energies.
20. A mass 1 kg is suspended from a spring of force constant 10^2 N/m and damping coefficient 10 Ns/m. The spring is driven by a periodic force of peak value 10N and of frequency double the natural frequency of the system. Calculate the amplitude of vibration.
21. Discuss Fourier analysis of a square wave.

(5 × 5=25)

PART D

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

22. Derive the expression for bending moment of a bent bar of rectangular cross-section.
23. What is a flywheel? How can we find the moment of inertia of a flywheel?
24. Calculate the moment of inertia of a circular disc (i) about an axis through its centre and perpendicular to its plane (ii) about a diameter (iii) about a tangent
25. Deduce the differential equation of a damped harmonic oscillator and discuss in detail the case of overdamping and underdamping.

(2 × 10=20)