B.Sc. DEGREE END SEMESTER EXAMINATION OCTOBER/NOVEMBER 2017

SEMESTER –1: PHYSICS (COMPLEMENTARY COURSE FOR MATHEMATICS)

COURSE: 15U1CPPHY1: PROPERTIES OF MATTER, MECHANICS AND FOURIER ANALYSIS

(Common for Regular 2017 admission and Supplementary/Improvement 2016 & 2015 admission)

Time: Three Hours   Max. Marks: 60

PART A

Answer all questions, 1 mark each (Total 8 marks)

1. State Hooke's law and define modulus of elasticity
2. What is yield point?
3. Define Poisson's ratio
4. Define a rigid body. Comment on the internal forces acting on it
5. Explain angular velocity and angular acceleration
6. What is resonance?
7. "All simple harmonic motions are periodic, but all periodic motions are not simple harmonic." Comment
8. Express the Fourier series of f(x)?   (1 x 8 = 8)

PART B

Answer any Six questions, 2 marks each (Total 12 marks)

9. Find out the bending moment for a rectangular cross section
10. Explain linear elasticity and volume elasticity
11. What is parallel axis theorem?
12. Discuss conservation of angular momentum
13. Compare linear motion and rotational motion
14. Site any two examples of SHM
15. A particle oscillates simple harmonically with amplitude 4 cm and frequency 5 Hz. Write down the equation as a function of t. At t=0, the particle is at equilibrium
16. Use Fourier series in representing a periodic function f(x) having a period 2π.   (2 x 6 = 12)

PART C

Answer any Four questions, 5 marks each (Total 20 marks)

17. Show that the bulk modulus K, Young's modulus Y and Poisson's ratio σ are related by

$$K = \frac{Y}{3(1 - 2\sigma)}$$

18. A steel ball of 20 gm moves under the influence of a force field such that its position vector at a time t is given by $\bar{r} = (2t - 3)\hat{i} + (t^2 + 2)\hat{j} - 2t^3\hat{k}$ in meters. Determine the angular momentum of the ball about the origin of the co-ordinate system and the torque acting on it at t=2s.

19. Find the angular momentum and kinetic energy of a thin circular disc of mass 1 kg and radius 0.1m, rotating with angular velocity 20π rad/s around the axis passing through its centre and perpendicular to its plane.

20. Obtain the total energy of a particle executing simple harmonic motion.

21. Deduce the expression for a_n in Fourier series expansion

22. Develop the Fourier series for a square wave   (5 x 4 = 20)

PART D
Answer **any Two** questions, 10 marks each (Total 20 marks)

23. Briefly discuss the theory of cantilever- uniform bending

24. What is rigidity modulus? Discuss the static torsion method to determine the same

25. Discuss the theory of fly wheel and derive the expression for moment of inertia

26. Define simple harmonic motion. Discuss the characteristics of a linear SHM   (10 x 2 = 20)

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