B.Sc. DEGREE END SEMESTER EXAMINATION - OCTOBER/NOVEMBER 2018

SEMESTER –1: PHYSICS (COMPLEMENTARY COURSE FOR MATHEMATICS)

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

(Common for Regular 2018 admission and improvement 2017/ supplementary 2017/2016/2015/2014 admission)

Time: Three Hours   Max. Marks: 60

PART A

*Answer **all** questions, **1** mark each*

1. Explain the terms stress and strain.
2. Why hollow cylinders are preferred to solid ones for making shafts?
3. What is meant by radius of gyration?
4. State parallel axes theorem.
5. Write down the differential equation for a simple harmonic oscillator.
6. What are forced oscillations?
7. What is meant by resonance?
8. State Fourier theorem.   (1 x 8 = 8)

PART B

*Answer **any six** questions, **2** marks each*

9. Show that in deforming a body the work done per unit volume is 1/2 x stress x strain.
10. Explain the static method to calculate the rigidity modulus.
11. What do you mean by torsional couple?
12. Derive an expression for the moment of inertia of a rod about a $\perp^r$ axis through its centre
13. Obtain the relation between torque and angular momentum.
14. Plot the variation of Potential and Kinetic energy with displacement of a harmonic oscillator.
15. What are the conditions for an oscillatory motion to be simple harmonic?
16. Define even and odd functions.   (2 x 6 = 12)

PART C

*Answer **any Four** questions, **5** marks each*

17. A copper wire of length 3m and diameter 0.4mm elongates by 5mm under the action of a force of 40N. What is the Young's modulus of the material?.
18. Calculate the depression at the free end of a cantilever loaded by 2 Kg at the free end. Length of the rod is 1.2m, breath 3cm and thickness 9mm. Young's modulus of the material is 1.9×10^{11} N/m^2.
19. A Sphere made of steel has a diameter of 20cm. Calculate its moment of inertia about a diameter. Given density of the steel is 8×10^3 Kg/m^3.
20. Derive an expression for the moment of inertia of a disc about an axis passing through its centre and perpendicular to the plane.

21. A particle makes simple harmonic motion along a straight line with amplitude 6 cm. Velocity of the particle while passing through the centre is 16 cm s^{-1}. Find the time period.

22. A particle executing SHM has a maximum velocity of 30cm/s and maximum acceleration of 60cm/s^2. Find its amplitude and frequency. (5 x 4 = 20)

PART D

*Answer **any two, 10** marks each*

23. What is a torsion pendulum? How it can be used to determine the rigidity modulus of a wire.

24. Derive an expression for the moment of inertia of a ring about an axis through a diameter and about a tangent.

25. Define simple harmonic motion and obtain its differential equation. Also derive expressions for kinetic and potential energies and show that total energy is a constant.

26. Deduce the harmonic components of a square wave using Fourier theorem.

(10 x 2 = 20)

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