C 82977

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Name...

Reg. No.....................................

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MAY 2015

(CUCBCSS–UG)

Core Course—Physics

PH 2B 02—PROPERTIES OF MATTER, WAVES AND ACOUSTICS

Time : Three Hours

Maximum : 80 Marks

Part A

Answer all questions.
Each question carries 1 mark.

1. The substance which shows practically no elastic after effect is ————.

2. Elastic forces are ———— forces.

3. Damping ———— the frequency of oscillations.

4. What does the mechanical energy of a oscillating particle consist of ?

5. If the disturbance or state of motion is continuously transmitted along the same direction, it is called a ————.

6. Antinodes are points at which the value of ————.

7. The walls of the halls built for music concerts should ————.

Check whether the following statements are True/False :—

8. For a material the Poisson's ratio is a dimensionless constant.

9. The frictional force in damped oscillations is not proportional to the velocity of the system.

10. Decibel is a measure of sound level.

(10 × 1 = 10 marks)

Part B

Answer all questions in two or three sentences each.
Each question carries 2 marks.

11. When is a body said to be perfectly elastic ?

12. What is meant by elastic fatigue ?

13. What is meant by restoring force ?

14. What is damping ? Give its effect ?

Turn over

15. Obtain the general equation of wave motion.

16. What are results of reflection of sound waves from rigid free boundary ?

17. Why are Girders designed in the shape of 1 ?

<div align="right">(7 × 2 = 14)</div>

Part C

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

18. Explain the terms :
    (a) Elasticity.
    (b) Elastic limit.
    (c) Yield point.
    (d) Breaking point.

19. Explain the terms :
    (a) Neutral surface.
    (b) Plane of bending.
    (c) Neutral axis.
    (d) Bending moment.

20. What is a coupled oscillator ? What are normal coordinates and normal modes of a co system ? Give its significance.

21. What is an harmonic oscillator ? Discuss a large amplitude pendulum as an harmonic osc

22. Explain what is meant by a forced harmonic oscillator. Define resonant frequency. W sharpness of resonance ?

23. Prove with theory that the velocity longitudinal waves in a rod depends on the Young's m and density of the material.

24. What is reverberation ? Explain the causes of reverberation in a hall. How can it be minim

<div align="right">(5 × 4 = 20)</div>

Section D

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

25. Find the work done in joules in stretching a wire of cross section 1sq : mm and length 2 through 0.1 mm. Young's modulus of wire is 2×10^{11} N/m^2.

26. A copper wire 3 m long and 1mm diameter has an Young's modulus of 12.5×10^{10} What extension will be produced if a weight of 10 kg is attached to one end of the wire after the other end ? What will be the lateral strain ? ($\sigma = 0.26$)

27. A particle executing SHM has a maximum displacement of 4 cm and its acceleration at a di of 1 cm from the mean position is 3 cm/sec^2. What will be its velocity when it is at a dista 2 cm from the mean position ?

28. A forced harmonic oscillator shows equal amplitude of oscillations at frequencies $\omega = 300$ and $\omega = 400$ rad/sec. Calculate the resonance frequency ω_s at which the amplitude be maximum.

29. A train of sound waves is propagated along a wide pipe and it is reflected from an open end. If the amplitude of the waves is 2×10^{-6} m and frequency 1000 Hz and wave length 40 cm, calculate the amplitude of vibration at a point 10cm from the open end inside the pipe.

30. A sitar wire is under a tension of 30 N and the length of the bridges is 0.8m. Calculate the speed of transverse waves on the wire and the fundamental frequency of vibration. 10 meter of sitar wire weighs.

31. The entry of people in an auditorium of volume 160000 cube meter and total absorption of 1000 square meter of open window raises the absorption by 600 square meter. Find the change in reverberation time.

(4 × 4 = 16 marks)

Part E

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

32. Derive the relation connecting Young's modulus Y, rigidity modulus η and Poisson's ratio σ.

33. What is a compound pendulum ? Derive an expression for the period of oscillation. Show that the centers of suspension and oscillation are mutually interchangeable.

34. What are damped oscillations ? Discuss over damping, critical damping and under damping. Calculate the power loss in a damped oscillator.

35. Derive an expression for the velocity of transverse waves in a stretched uniform string.

(2 × 10 = 20 marks)