

19U205S

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Name.....

Reg. No.....

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2020

(CUCBCSS – UG)

CC15U PH2 B02 – PROPERTIES OF MATTER, WAVES & ACOUSTICS

(Physics – Core Course)

(2015 to 2018 Admissions – Supplementary/Improvement)

Time: Three Hours

Maximum: 80 Marks

Section A

Answer *all* questions. Each question carries 1 mark.

1. Young's modulus of a perfectly rigid body is
2. What is the theoretical value for the upper limit of Poisson's ratio?
3. The value of strain for a wire stretched to double of its length is
4. The length of pendulum is increased by 20%. The percentage increase in period of the pendulum is given by
5. The potential energy of a particle executing SHM is maximum at
6. Quality factor is defined as
7. The unit of loudness is
8. The expression for period of oscillation of a simple pendulum is $T =$
9. Sound waves of frequency greater than are called hypersonic.
10. The velocity with which a harmonic wave moves is called.....

(10 x 1 = 10 Marks)

Section B

Answer *all* questions. Each question carries 2 marks.

11. What do you mean by flexural rigidity?
12. What is logarithmic decrement?
13. What is an I section girder? Why are I section girders preferred?
14. Differentiate between harmonic oscillator and anharmonic oscillator
15. Write short note on damping force and relaxation time.
16. What are Lissajous figures?
17. Write a note on acoustic grating.

(7 x 2 = 14 Marks)

Section C

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

18. Define stress, strain, Poisson's ratio and modulus of elasticity.
19. What you mean by bending moment? Define neutral surface and plane of bending.
20. Deduce an expression for couple per unit twist of a uniform solid cylinder.
21. State and explain Fourier theorem. Give the conditions for the acceptability of Fourier theorem.
22. Show that for a harmonic oscillator, the average potential energy is equal to the average kinetic energy.
23. Obtain the differential equation of wave motion.
24. What is reverberation and give Sabine's formula.

(5 x 4 = 20 Marks)

Section D

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

25. A steel wire of length 2 m is stretched through 2 mm. The cross sectional area of the wire is 4 mm^2 . Calculate the elastic potential energy stored in the stretched wire. Y for steel = $2 \times 10^{11} \text{ N/m}^2$
26. Calculate the twisting couple on a solid shaft, of length 1.5 m and diameter 120 mm when it is twisted through an angle of 0.6° . The coefficient of rigidity for the material of the shaft may be taken to be $93 \times 10^9 \text{ N/m}^2$.
27. A simple pendulum has 0.1 J energy when its length is 2 m and the amplitude of motion of the bob is 3 cm. What will be its energy when length is not changed but amplitude is 6 cm.
28. Obtain the time required to decay to half amplitude in the case of a LCR circuit, if $L = 20 \text{ mH}$, $C = 1 \mu\text{F}$ and $R = 0.1 \text{ ohm}$. What is the quality factor?
29. The equation of a point executing SHM is given as $x = 4\sin[(\pi/2)t + (\pi/4)]$ in meters. Find a) the period of oscillation b) the maximum velocity of the point c) its maximum acceleration.
30. Plane waves of frequency 500 Hz are produced in air with amplitude 10^{-3} cm . Deduce energy density and intensity.
31. A source of sound emits power of $400\pi \text{ W}$. What is the loudness of sound at a distance 10 meter from the source? If there are 10 such sources what is the percentage increase in loudness?

(4 x 4 = 16 Marks)

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Section E

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

32. What is a cantilever? Obtain the expression for the depression at the free end of the cantilever.
33. Obtain the differential equation for a damped harmonic oscillator and solve it for different damping conditions.
34. Explain the propagation of waves in a gaseous medium and obtain the expression for velocity.
35. Discuss the important factors affecting acoustics of a building.

(2 x 10 = 20 Marks)

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