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QP CODE: 19101728

19101728

Reg No : .....

Name : .....

B.Sc. DEGREE (CBCS) EXAMINATION, MAY 2019

Second Semester

Core Course - **PH2CRT02 - MECHANICS AND PROPERTIES OF MATTER**

(Common for B.Sc Physics Model I ,B.Sc Physics Model II Applied Electronics ,B.Sc Physics Model II Computer Applications ,B.Sc Physics Model III Electronic Equipment Maintenance)

2017 ADMISSION ONWARDS

327A46C5

Maximum Marks: 60 **Time: 3 Hours**

Part A

Answer any **ten** questions.

Each question carries **1** mark.

1. Define a longitudinal wave with an example.
2. Write down the expression for the energy density of a plane progressive harmonic wavetravelling along the positive x-direction and explain each term.
3. Two adjacent piano keys are struck simultaneously. The notes emitted by them have frequencies 412 Hz and 417 Hz. Write down the number of beats heard per second.
4. When a simple pendulum is kept on the moon , what is the difference seen on its speed of oscillation and time period?
5. State parallel axes theorem.
6. State perpendicular axes theorem.
7. Write down the expression for work done in deforming a body under volume strain.
8. Graphically represent the relation between the distance between the knife edges l and elevation δ at the middle of a beam supported by two knife edges and symmetrically loaded.
9. In the torsion pendulum experiment, error in the measurement of which quantity can lead to large error in the answer?
10. Distinguish between streamline and turbulent flow.
11. Give any four factors affecting surface tension.
12. Define surface energy of a liquid film.

(10×1=10)

Part B

Answer any **six** questions.

Each question carries **5** marks.

13. A wire gives a fundamental frequency of 256 Hz when it is under a tension of 25 kg-wt. Under what tension will the string emit a frequency of 768 Hz

14. A body of mass 2 kg suspended through a vertical spring executes simple harmonic motion of period 6 s. Find the potential energy and kinetic energy at 2cm if the maximum amplitude is 5cm

15. Find the wavelength and the phase difference between two points at x = 2m and x = 7.232 m of the plane progressive wave given by y = 0.3 sin (40t - 3x). Find the damping constant and the damping coefficient.

16. Find the moment of inertia of a solid cylinder of mass 1 kg, length 24 cm with a diameter 20 cm about an axis perpendicular to its length and passing through one of its ends.

17. A flywheel of mass200kg and radius of gyration 0.6m is given an angular speed of 150rpm in 90 rotations starting from rest. Determine the torque acting on it.

18. The diameter of brass rod is 4mm.Young's modulus of brass is $9.9 \times 10^{10} N/m^2$.Calculate the force required to stretch by 0.1% of its length.

19. A rod having a diameter of 1.26cm is placed on two knife edges separated by a distance of 0.7m. A load of 0.9kg is hanged on the road at its midpoint and the corresponding depression is 0.025cm. Calculate the Young's modulus of the material of the rod.

20. A metal plate$100cm^2$ in area rests on a layer of castor oil 2mm thick whose coefficient of viscosity is 1.55 Nsm^{-2}. Calculate the horizontal force required to move the plate with a speed of $0.03ms^{-1}$.

21. Assuming that the surface tension of rain water is 0.072N/m. Find the difference of pressure between inside and outside of a rain drop of diameter 0.02cm.

(6×5=30)

Part C

Answer any **two** questions.

Each question carries **10** marks.

22. Setup the differential equation for a simple harmonic motion and obtain the velocity and acceleration of the particle. Also graphically show the different positions of the particle at intervals of T/4, T/2, 3T/4 and T for displacement, velocity and acceleration.

23. Obtain an expression for Moment of inertia of an annular ring (i) about an axis passing through its centre of mass and perpendicular to its plane (ii) about its diameter.

24. Derive Poiseuille's equation in hydrodynamics.

25. Derive the Bernoulli's equation for a liquid flowing through a pipe held horizontally.

(2×10=20)

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(Pages : 2) Reg. No.....

Name.....

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B.Sc. DEGREE (C.B.C.S.) EXAMINATION, JUNE 2018

Second Semester

Core Course—PH2 CRT 02—MECHANICS AND PROPERTIES OF MATTER

(Common to Physics M I, Physics M II Applied Electronics/Computer Applications and Model III Physics-EEM)

[2017 Admissions only]

Time : Three Hours Maximum : 60 Marks

Part A

Answer any **ten** *questions.*
Each question carries 1 *mark.*

1. What is a wave function ?
2. Distinguish between longitudinal and transverse waves.
3. What are standing waves ?
4. What do you mean by beats ?
5. State parallel axes theorem.
6. State the law of conservation of angular momentum.
7. What is a flywheel ? What are the uses of a flywheel ?
8. Define the term radius of gyration.
9. What is mean by flexural rigidity ?
10. Which is more elastic-air or water ? Explain the reason.
11. What is the use of heating while washing clothes ?
12. Explain the term viscosity. Give its unit.

(10 × 1 = 10 marks)

Part B

Answer any **six** *questions.*
Each question carries 5 *marks.*

13. In an experiment a string is found to vibrate in 4 loops when it is stretched with a tension of 3N. How much tension is required to be applied so as to make it vibrate in 6 loops.

Turn over

14. Two tuning turks A and B produce 4 beats per second. On loading B with wax 6 beats are heard per second. It the quality of wax is reduced the humber of beats heard per second becomes 4. Find the frequency of B if A's frequency is 480 Hz.

15. A particle executes SHM of period 1.2 sec and amplitude 8 cm. Find the time its takes to travel 5cm from the mean position.

16. A circular ring has a mass 120 gm and radius 10 cm. Determine its moment of inertia (a) about a diameter and (b) about an axis passing through its centre and perpendicular to its plane.

17. A stone is tied to the end of a string of length 25 cm makes 5 rps. If the length of the thread is reduced by 5cm, find the number of revolutions it will make in a second.

18. Calculate the MI of a uniform disc of mass 0.4 kg and radius 10 cm about an axis passing through its edge and perpendicular to the plane of the disc.

19. A copper wire of length 3 m and 1 mm diameter is subjected to a tension of 5 N. Calculate the elongation produced, if the Young's modulus of copper is 120 GPa.

20. The diameter of a brass rod is 4 mm. Young's modulus of brass is $9 \times 10^9 N/m^2$. Calculate the force required to stretch 0.1% of its length.

21. A sphere of water of radius 0.1 mm is sprayed into a million drops, all of the same size. Find the energy expended in doing so. Surface tension of water is 0.072 N/m.

(6 × 5 = 30 marks)

Part C

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

22. Obtain an expression for the velocity of transverse waves in a string. Give expression for the frequencies of vibration.

23. Derive the expression for a simple harmonic oscillator and obtain its velocity and displacement. Also explain the theory of damped harmonic oscillators.

24. Derive the expression for the moment of inertia of a solid cylinder about an axis passing through the centre of mass and perpendicular to the length.

25. Discuss the Poiseuilles method of determining the viscosity of liquid.

(2 × 10 = 20 marks)

QP CODE: 20101108

20101108

Reg No : .....

Name : .....

B.Sc. DEGREE (CBCS) EXAMINATION, NOVEMBER 2020

Second Semester

Core Course - PH2CRT02 - MECHANICS AND PROPERTIES OF MATTER

(Common for B.Sc Physics Model I ,B.Sc Physics Model II Applied Electronics ,B.Sc Physics Model II Computer Applications ,B.Sc Physics Model III Electronic Equipment Maintenance)

2017 ADMISSION ONWARDS

B1D2D6E9

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

*Each question carries **1** mark.*

1. What do you understand by a stationary wave?
2. What is the source of sound behind musical instruments like guitar and violin?
3. Given an object oscillating horizontally in simple harmonic motion, where in the course of its motion are the magnitudes of potential energy and kinetic energy equal to zero? Where do they become equal and have their maximum value?
4. What is meant by resonance?
5. Write down the expression for moment inertia of a annular disc about an axis passing through its centre and perpendicular to its plane. And explain the terms.
6. Write down the expression for moment inertia of a solid sphere about its diameter
7. Write down the expression for work done in deforming a body under longitudinal strain.
8. Distinguish between uniform and non-uniform bending of beams.
9. Explain streamline flow of a liquid.
10. Define coefficient of viscosity. What is its unit?
11. What is the role of temperature in washing clothes?
12. Why the excess pressure inside a bubble is double that inside a liquid drop?

(10×1=10)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. The wavelength of sound wave in air is 0.25m. Find its wavelength in metal rod. Velocity of sound in air is 345 m/s and in metals is 4850 m/s. Also find the corresponding frequencies in air and metal rod.

14. A musical instrument emits a sound of frequency 512 Hz with an amplitude 10^{-4} m. Calculate the energy flux, if the speed of sound in air is 332 m/s and density of air is 1.29 kg/m^3

15. A square board of side 4m is joined along its upper edge and oscillates in a vertical plane. Calculate its period of oscillation.

16. Prove parallel axis theorem

17. A thin cord is wound 3 times on the axle of a flywheel. A mass of 2kg is suspended from its free end which is at a height of 25cm from the ground. The flywheel makes 20 revolutions in 4 sec after the chord slips from the peg. If the radius of the axle is 1.0cm. Find the M.I of the wheel about its axle.

18. A metal plate having 1cm thickness is 1m in breadth and 1m in length. One face of the large area is fixed and a tangential force is applied to the opposite face. The displacement of the edge produced thereby is 0.005cm. Find the shearing stress, strain and magnitude of the tangential force applied. Modulus of rigidity of the metal is 8.4×10^{10} Nm^{-2}.

19. A square bar of length 1m and cross section $1cm^2$ is clamped horizontally at one end and a weight of 1kg is applied at the other end. Neglecting weight of the bar, calculate the depression at the loaded end. Given Young's modulus of the material of the bar = $9.78\times10^{10}N/m^2$ and $g = 9.78m/s^2$.

20. Two capillaries of radii R_1 and R_2 and length L_1 and L_2 are joined in series. If P_1 and P_2 are the pressure difference between the ends of the first and second capillary tubes, derive an expression for the rate of flow of the liquid through the arrangement using Poiseuille's formula.

21. In a horizontal pipe line of uniform area of cross section, the pressure falls by $5Nm^{-2}$ between two points separated by a distance of 1km. What is the change in kinetic energy per kg of the oil flowing at these points? Density of oil = $800kg/m^3$.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **10** marks.*

22. What do you understand by a periodic motion? Are all periodic motions oscillatory, give reasons. What are the charteristics of a simple harmonic motion, frame the differential equation for the same and thus obtain its solution. Discuss conditions of velocity and acceleration atthe mean and extreme positions.

23. Define the following and give their formula and explain: i. Angular velocity ii. angular acceleration iii. angular momentum iv. Torque v. moment of inertia

24. Derive the expression for moment of torsional couple for a cylindrical rod. Also explain how static torsion apparatus can be used to measure the rigidity modulus of the material of the rod.

25. Discuss the static torsion method and torsion pendulum method to measure the rigidity modulus of a material.

(2×10=20)

21103148

QP CODE: 21103148

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE EXAMINATIONS, DECEMBER 2021

Second Semester

Core Course - PH2CRT02 - MECHANICS AND PROPERTIES OF MATTER

(Common for B.Sc Physics Model I, B.Sc Physics Model II Applied Electronics, B.Sc Physics Model II Computer Applications, B.Sc Physics Model III Electronic Equipment Maintenance)

2017 ADMISSION ONWARDS

BEC4940E

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

*Each question carries **1** mark.*

1. Write down the equation for plane progressive harmonic wave travelling along the positive x-direction.
2. What do you understand by first overtone and second overtone in strings?
3. A particle has a mass of o.5 kg. It is executing simple harmonic motion with a frequency of 70 Hz and amplitude 5 cm. Find the potential and kinetic energy at a point 2 cm from the mean position.
4. Compare the time displacement for curves of critically damped, overdamped and underdamped harmonic oscillators.
5. Write down the expression for moment inertia of a solid cylinder about an axis passing through the centre of mass and perpendicular to its length.
6. What is flywheel? What are the uses of flywheel?
7. Write down the expression for work done in deforming a body under shearing strain.
8. Nowadays rectangular steel pipes are commonly used for construction purpose. Why?
9. State Newton’s law of viscous force in streamline flow.
10. Which quantity is to be measured with greater care so that the error is minimum in an experiment to measure the viscosity of a liquid using Poiseuille’s equation?
11. Why soaps and detergents are used in washing clothes?
12. Why a soap bubble has excess pressure inside it?

(10×1=10)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. The limits of audibility of the ear in terms of wavelength are 13.8m and 0.017m. Calculate the lower and upper limits of audibility in terms of frequency. Velocity of sound in air is 345 m/s.

14. Calculate the velocity of sound in a gas where two waves of wavelength 50 cm and 50.5 cm produce 6 beats per second.

15. A compound pedulum is formed by suspending a heavy ring of radius 2m from a point on its circumference. Calculate the period of oscillations.

16. A symmetrical body is rotating about its axis at the rate of 3 revolutions per sec. Calculate the angular momentum if about its axis the moment of inertia is 2 kg m^2

17. A uniform meter scale has a mass 150g. What is its moment of inertia if the scale is rotated about its axis perpendicular to its length and passes through (a) the centre and (b) the 75cm mark?

18. If Young's modulus and Bulk modulus of a metal are $7.25\times10^{11}N/m^2$ and $11\times10^{10}N/m^2$ respectively, find the Poisson's ratio and rigidity modulus of the material.

19. Calculate the work done in twisting a wire of radius 1mm and length of 25cm through an angle of 450. Given the rigidity modulus of steel is $8\times10^{10}N/m^2$.

20. A uniform metal disc of diameter 0.1m and mass of 1.2kg is fixed symmetrically to the lower end of torsion wire in a torsion pendulum experiment. If the length of the wire is 1m and its diameter is 1.44mm and the time period of torsional oscillations is 1.98s, calculate the modulus of rigidity of the material of the wire.

21. Water flows through a horizontal pipe line of varying cross section. At a particular point the pressure of water is 0.05m of mercury and the velocity of flow are 0.25m/s. Calculate the pressure at another point where velocity of water is 0.4m/s. Given density of mercury is 13.6 times that of water.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **10** marks.*

22. Define simple harmonic motion. Starting from the differential equation of simple harmonic motion, obtain the solution, velocity, acceleration and time period. Also discuss the conditions for maximum and minimum velocity and acceleration in this case.

23. State parallel and perpendicular axis theorems. Derive the expression for moment of inertia of a straight rod about an axis passing through its centre and perpendicular to its length.

24. Derive the expression for the elevation at the middle of a symmetrically loaded beam.

25. Derive the expression for the depression at the loaded end of a cantilever.

(2×10=20)

QP CODE: 23124541

23124541

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / IMPROVEMENT / REAPPEARANCE EXAMINATIONS, MAY 2023

Second Semester

CORE COURSE- PH2CRT02 - MECHANICS AND PROPERTIES OF MATTER

(Common for B.Sc Physics Model I, B.Sc Physics Model II Applied Electronics, B.Sc Physics Model II Computer Applications, B.Sc Physics Model III Electronic Equipment Maintenance)

2017 ADMISSION ONWARDS

17B76B20

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

*Each question carries **1** mark.*

1. How are the mechanical waves broadly classified? Give an example each.
2. What does the differential equation for a one-dimensional wave travelling along the positive x-direction signify?
3. What do you understand by fundamental frequency in strings?
4. Write down the expression for the differential equation of a simple harmonic motion and explain its symbols.
5. Define angular displacement. Give its unit.
6. Write down the expression for moment inertia of a solid sphere about its diameter.
7. What happens when the stress applied to the body is increased beyond the elastic limit and is removed after some time?
8. Define bending moment.
9. Define flexural rigidity.
10. Explain a method to introduce torsion in a small cylindrical rod.
11. What is meant by torsional oscillations?
12. Define coefficient of viscosity. What is its unit?

(10×1=10)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. The frequency of the tunning fork B is 512 Hz. It is sounded with another tunning fork A, so that 4 beats are heard. Find the frequency of the tunning fork A if it is filled and when sounded with B, beats occur at shorter intervals.

14. A mass of 2 kg oscillating on a spring with constant 4 N/m passes through its equilibrium point with a velocity of 8 m/s. What is the energy of the system at this point? From your answer derive the maximum displacement, xm of the mass.

15. A metal disc of radius r and mass m oscillates in its own plane about an axis passing through a point on its edge. Calculate the length of the equivalent simple pendulum.

16. A uniform meter scale has a mass 150g. What is its moment of inertia if the scale is rotated about its axis perpendicular to its length and passes through (a) the centre and (b) the 75cm mark?

17. Calculate the torque applied to a flywheel having M.I about its axis of rotation as 200 kgm^2, to increase the angular velocity by 10 rad/s in 2s from its rest position.

18. A rod having a diameter of 1.26cm is placed on two knife edges separated by a distance of 0.7m. A load of 0.9kg is hanged on the road at its midpoint and the corresponding depression is 0.025cm. Calculate the Young's modulus of the material of the rod.

19. A large bottle is fitted with a siphon made of capillary glass tubing. Compare the coefficient of viscosity of water and petrol if the time taken to empty the bottle in the two cases is in the ratio 2:5. Density of petrol is 0.8 times that of water.

20. A liquid drop of radius R breaks up into 64 small drops having a radius r. Calculate the change in energy.

21. Calculate the work done in blowing a soap bubble of radius 1cm to 10cm? Surface tension of soap solution = 0.026N/m.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **10** marks.*

22. Write down the differential equation of a damped harmonic oscillator. Discuss the solution to the equation and the three conditions surrounding it.

23. State and prove parallel axis and perpendicular axis theorem.

24. Derive the expression for the elevation at the middle of a symmetrically loaded beam.

25. State Bernoulli's Theorem and derive the Bernoulli's equation.

(2×10=20)