



15. Two masses of 10 gm. and 90 gm are connected by a spring of length 10 cm and force constant 10^3 N/m , calculate the frequency of oscillation.
16. The frequency of the fourth harmonic in a stretched string of length 20 cm. is 600 per sec. What is the velocity of the wave in the string ? If now the tension of the string is doubled, what will be the final velocity of the waves ?
17. Four spheres each of diameter $2a$ and mass m are placed with their centres on the four corners of a square of side b . Calculate the moment of inertia of the system about any side of the square.
18. A grind stone has a moment of inertia of 50 S.I. units. A constant couple is applied and the grindstone is found to have speed of 150 revolutions per minute, 10 sec. after starting from rest. Find the couple C .
19. What is the angular momentum of a particle whose rotational kinetic energy is 18 joules, if the angular momentum vector coincides with the axis of rotation and its moment of inertia about the axis is 0.01 kg-m^2 .
20. Find the wavelength associated with 10 KeV electron.
21. A body having a mass of 4 gm. executes S.H.M. The force acting on the body when displacement is 8 cm is 24 gm. wt. Find the period. If the maximum velocity is 500 cm./sec., find the amplitude and maximum acceleration ($g = 9.81 \text{ m/sec}^2$).
22. Two masses of 10 gm and 90 gm are connected by a spring of length 10 cm and force constant 10^3 N/m , calculate the frequency of oscillation.
23. The frequency of the fourth harmonic in a stretched string of length 20 cm is 600 per sec. What is the velocity of the wave in the string ? **(9×2=18)**

SECTION – D

Answer **any one** question. **Each** question carries a weightage of **4** :

24. Derive an expression for the moment of inertia of a hollow sphere about its diameter and a tangent. Compare the results with those of a solid sphere of the same mass.
25. Derive Schrodinger's time independent wave equation. **(1×4=4)**



Reg. No. :

Name :

I Semester B.Sc. Degree (CCSS – Supple/Improv.)
Examination, November 2014
(2013 and Earlier Admn.)
COMPLEMENTARY COURSE IN PHYSICS
1C01 PHY : Mechanics

Time : 3 Hours

Total Weightage : 30

SECTION – A

Choose the correct answer; **each** bunch carries a weightage of **1** :

- I. i) The total energy of a particle, executing simple harmonic motion is
a) αx b) αx^2 c) independent of x d) $\alpha x^{1/2}$
Where x is the displacement from the mean position ?
- ii) A mass m is vertically suspended from a spring of negligible mass and the system oscillates with a frequency n . What will be the frequency of the system, if a mass $4m$ is suspended from the same spring ?
a) $v/4$ b) $v/2$ c) $2v$ d) $4v$
- iii) A spring having a spring constant k is loaded with a mass m . The spring is cut into two equal parts and one of these is loaded again with the same mass. The new spring constant is
a) $k/2$ b) k c) $2k$ d) k^2
- iv) Electron microscope works on the principle of
a) quantum nature b) wave nature
c) partical nature d) none of the above

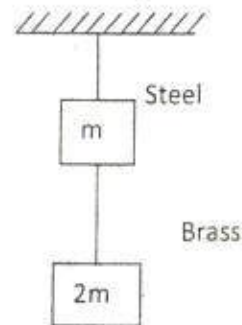


- II. i) Two wires of equal length and cross-section area suspended as shown in Fig. Their Young's modulus is Y_1 and Y_2 respectively. The equivalent Young's modulus will be



- a) $Y_1 + Y_2$ b) $\frac{Y_1 + Y_2}{2}$ c) $\frac{Y_1 Y_2}{Y_1 + Y_2}$ d) $\sqrt{Y_1 Y_2}$

- ii) If the ratio of lengths, radii and Young's moduli of steel and brass wires in the Fig. 8.8 are a , b , c respectively. Then the corresponding ratio of increase in their lengths would be



- a) $\frac{2ac}{b^2}$ b) $\frac{3a}{2b^2c}$ c) $\frac{3c}{2ab^2}$ d) $\frac{2a^2c}{b}$

- iii) When a wire undergoes a linear tensile strain, it experiences a lateral contraction also. The ratio of lateral contraction to longitudinal strain is known as

- a) Young's modulus b) Bulk modulus
c) Poisson ratio d) None of the above

- iv) The compressibility of waters is 4×10^{-5} per unit atmospheric pressure. The decrease in volume of 100 cm^3 of water under a pressure of 100 atmosphere will be

- a) 0.4 cm^3 b) $4 \times 10^{-5} \text{ cm}^3$ c) 0.025 cm^3 d) 0.004 cm^3

(2×1=2)



SECTION – B

Answer **any six** questions. **Each** question carries a weightage of 1.

- State the theorems in moment of inertia.
- What is Q-factor of an oscillator ?
- What is torsional potential energy ?
- Why a hollow shaft is a better device compared to a solid one made of the same material length and mass ?
- Compare the depression for uniform and non uniform bending.
- What are stationary waves ? Mention some of their important properties.
- Explain the laws of transverse vibrations of a stretched string.
- The uncertainty in the velocity of an electron is 0.01%. Calculate the uncertainty in the position of electron.
- Obtain the differential equation for a damped harmonic oscillator. (6×1=6)

SECTION – C

Answer **any nine** questions. **Each** question carries a weightage of 2.

- A steel tape is stretched so that its length is 0.001% of its initial line. Calculate the stress required ($Y = 200 \text{ GPa}$).
- A wire of length 3 m and radius 0.5 mm is stretched by a load 5 kg so as to produced an elongation of 1 mm. Calculate the Young's modulus of the material of the wire.
 - Calculate the first three eigens values of an electron confined in a 1 Å box.
- A body having a mass of 4 gm. executes S.H.M. The force acting on the body when displacement is 8 cm. is 24 gm. wt. Find the period. If the maximum velocity is 500 cm./sec., find the amplitude and maximum acceleration ($g = 9.81 \text{ m/sec}^2$).