

Model Question Paper 1- 21BS12 I-SEM with effect from 2021 (CBCS Scheme)

USN

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First Semester B.Sc. Degree Examination

Subject Title: Mechanics and Properties of Matter (Physics)

TIME: 03 Hours

Max. Marks: 100

- Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.
 02. Draw neat sketches where ever necessary.
 03. **Constants** : Speed of Light " c " = $3 \times 10^8 \text{ ms}^{-1}$, Boltzmann Constant " k " = $1.38 \times 10^{-23} \text{ JK}^{-1}$,
 Planck's Constant " h " = $6.625 \times 10^{-34} \text{ Js}$, Acceleration due to gravity " g " = 9.8 ms^{-2} ,
 Permittivity of free space " ϵ_0 " = $8.854 \times 10^{-12} \text{ F m}^{-1}$.

Module -1			Marks
Q.01	a	State and explain law of conservation of angular momentum. Derive the expression for work done by a torque.	08
	B	Derive Kepler's second law of planetary motion.	08
	C	Calculate the angular velocity of the wheel of a vehicle moving at a speed of 180 km/h. The diameter of the wheel is 0.11m.	04
OR			
Q.02	A	What is elastic and inelastic collisions. Discuss elastic collision between two particles which do not stick together in laboratory frame of reference.	08
	B	Discuss the conservation of linear momentum in case of variable mass. Mention the expression for single stage rocket.	08
	C	A grinder is in the form of a circular disc of mass 10 kg and diameter 0.4 m. Calculate the constant torque that has to be applied so that the disc acquires an angular velocity of 4 revolution/second in 5 seconds. Also calculate the rate at which work is done by torque at the end of 5 seconds.	04
Module-2			
Q. 03	A	Obtain an expression for kinetic energy of a rotating body.	08
	B	Derive an expression for moment of inertia of rectangular lamina.	08
	C	A fly wheel is a uniform disc of mass 72 kg and radius 0.5 m. Calculate Moment of Inertia and its kinetic energy when it is rotating at 70 r.p.m	04
OR			
Q.04	A	State and prove the theorem of perpendicular axes as applied to moment of inertia.	10
	B	Define moment of Inertia and explain its physical significance.	06
	C	Calculate the MI of a rectangular plate of mass 1 kg about an axis through its center of gravity and perpendicular to its plane. Its length is 0.2 m and breadth 0.1m. Find its radius of gyration about the same axis	04
Module-3			
Q. 05	A	Define simple harmonic motion. Obtain an expression for total energy of a particle executing simple harmonic motion.	10
	B	Define Resonance. Explain Helmholtz resonator.	06
	C	A 20 gm oscillator with natural frequency 10 rad/s is vibrating in damping medium. The damping force is proportional to the velocity of the vibration. If the damping coefficient is 0.17, how does the oscillation decay.	04
OR			

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Shasha Hu



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