## Bihar Engineering University, Patna B.Tech 1st Semester Exam-2022

Course: B.Tech. Code: 101101

Subject: Physics (Mechanics)

Time: 03 Hours Full Marks: 70

	truction							
(i)		arks are indicated in the right-ha						
(11) 21115	There	are NINE questions in this paper	:					
		ot FIVE questions in all. ion No. 1 is compulsory.						
(v)			naminas					
	The state of the s							
Q.1		ose the correct option of the follo		$[2 \times 7 = 14]$				
	(a)	The angular velocity of rotating body is expressed in terms of						
		.(i) revolution per minute	(ii) radians per	second				
		(iii) metre per second	(iv) None of th	ese				
	(b)	Which of the following statements is wrong?						
		(i) The matter contained in a body is called mass						
		·(ii) The force with which a body is attracted towards the centre of the earth is called weight						
		(iii) The total motion possessed	is called impulsive force					
		(iv) None of the above	•					
	(c) Which type of vibration is also known as transient vibrations?				vibrations?			
		(i) Undamped vibration	(ii) Damped v	ibration				
		(iii) Torsional vibration	(iv) Transverse	vibration				
	(d) Transmissibility is the ratio of							
		(i) force transmitted to the supporting structure and force impressed upon the system						
		.(ii) displacement amplitude of mass and displacement amplitude of supporting structure (iii)Both (i) and (ii)						
		(iv) None of the above						
(e) A non-inertial reference frame is a frame of respect to an inertial frame.				nce that is undergoing with				
		(i) velocity	(ii) acceleration	on				
		(iii) Both (i) and (ii)	(iv) None of th	ese				
	(f)	A turning car with constant spe	ed is the example of	is the example of				
		(i) inertial reference frame	(ii) non-inertia	(ii) non-inertial reference frame				
		(iii) Both (i) and (ii)	(iv) None of th	(iv) None of these				
	(g)			ng a circular path, then the particle has				
	(i) tangential acceleration of		•	(ii) centripetal acceleration only				
		(iii) both tangential and centripe	etal acceleration	(iv) None of these				
	(h)	Gradient of scalar field is to the equipotential surface.						
		(i) parallel		(ii) perpendicular				
		(iii) inclined	(iv) None of th					

<ul> <li>(a) Harmonic oscillator</li> <li>(b) Motion of a rod executing canonical motion with centre of mass fixed</li> <li>Q.4 (a) Discuss three-dimensional rigid body motion describing angular velocity and moment of inertia tensor.</li> <li>(b) The position of a particle of mass m under the influence of a free particle is given by r̄ = A sin ωtî + B cos ωtĵ. Find the expression for its force.</li> <li>(c) Express s̄ of cylindrical coordinate system into unit vectors of Cartesian coordinate system.</li> <li>Q.5 (a) Explain Euler's law of motion and derive an expression for the Euler's equation of motion for rigid body.</li> <li>(b) Prove that curl of a conservative force is equal to zero.</li> <li>Q.6 Write and solve equation of motion of a mass executing simple harmonic oscillation in the presence of a damping force. Also discuss the cases of over damping, critical damping and undamping oscillations.</li> <li>Q.7 (a) Show that if the total linear momentum of a system of particles is zero, the angular momentum of the system is the same around all origins.</li> <li>(b) A particle with a mass of 4kg has a position vector in metre given by r = 3t²² - 2tĵ - 3tk, where t is the time in seconds. For t = 3 seconds, determine the magnitude of the angular momentum of the particle and the magnitude of the moment of all forces on the particle, both about the origin of coordinates.</li> <li>Q.8 Write short notes on the following:  (a) Critically damped oscillator</li> <li>(b) Satellite maneuver</li> </ul>		(1)	Example of non-conservative force is					
<ul> <li>(j) Pooja spins a ball of mass m attached to a string of length r around her head with a velocity v. If the ball splits in half, losing exactly one-half of its mass instantaneously, what is its new velocity, v.?</li> <li>(i) v.</li> <li>(ii) v.4</li> <li>(iii) 2v.</li> <li>(iii) v.4</li> <li>(iii) 2v.</li> <li>(iv) 4v.</li> <li>(iv) 4v.</li> <li>(ii) 2v.</li> <li>(iv) 4v.</li> <li>(iv) 6v.</li> <li>(iv) 6v.</li> <li>(iv) 6v.</li></ul>			(i) gravity	(ii) ideal spring (Hooke's law)				
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