Shirpur Education Society's
R. C. PATEL INSTITUTE OF TECHNOLOGY, SHIRPUR
An Autonomous Institute
I Affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere I
आर. सी. पटेल इन्स्टिट्यूट ऑफ टेक्नॉलॉजी, शिरपूर
(स्वायत्त महाविद्यालय)

A.Y. 2022-23-Year-III /Semester-V

Program: B.Tech (MECH ENGG)   Max Marks:75
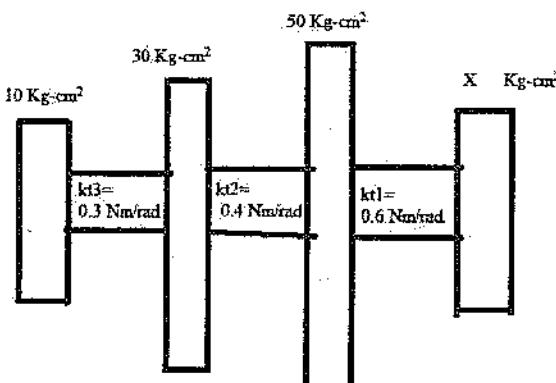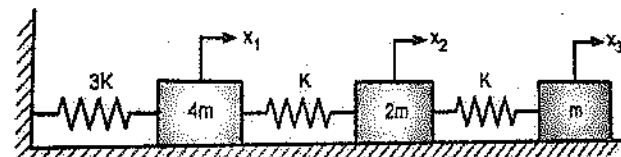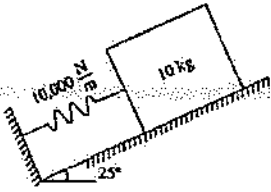Course: Mechanical Vibrations (PCME5030T)   Time: 10.30am-01.30 pm
Date: 10/01/2023   Duration: 3 Hrs

END SEMESTER EXAMINATION ODD SEM- V – JAN- 2023

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover page of the Answer Book, which is provided for their use.
(1) This question paper contains two pages.
(2) **All Questions are Compulsory.**
(3) All questions carry equal marks.
(4) **Answer to each new question is to be started on a fresh page.**
(5) **Figures in the brackets on the right indicate full marks.**
(6) **Assume suitable data wherever required, but justify it.**
(7) Draw the neat labelled diagrams, wherever necessary.

Question No.		Max. Marks
Q1 (a)	i). Using Holzer's table find the inertia of rotor X in figure so that the highest natural frequency is 20 rad/sec. If the displacement of X is 1.5 Deg. Find the displacement of other rotors.	[06]
	OR	
	ii)A three degree of freedom system is shown in fig. write down its three differential equations of motion by Newton's second law. Put these equations in matrix form.	[06]
Q1 (b)	20 N at 30cm ,30 N at 60 cm and 10 N at 100 cm's from the fixed end are the on cantilever beam. The deflection under 30N load due to all loads is 2 mm, what would be the natural frequency of transverse vibration if 20N is added at 80 cm from fixed end? Deflection at a section 'i' due to unit load 'section. $$U_{ij} = \frac{S_i^2(3S_j - S_i)}{Constant} \text{ for } S_i < S_j, \ U_{ij} = U_{ji}$$	[09]

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Q2 (a)	i) An Underdamped shock absorber is to be designed for a motor cycle of mass 250kg such that during road bump, the damped period of vibration is limited to 3 sec and amplitude of vibration should reduce to one eighteenth in one cycle. Find the stiffness of the spring and damping coefficient of shock absorber.	[09]
	OR	
	ii) A door 200 cm high, 75 cm wide and 4 cm thick and weighing 35 kg is fitted with an automatic door closer. The door opens against a spring with a modulus of 1 kgcm/radian. If the door is opened 90 Deg. and released, how long will it take the door to be within 1Deg. of closing? Assume the return spring of the door to be critically damped.	[09]
Q2 (b)	The Block as shown in Fig.is displaced 25mm and released.it is observed that the amplitude decreases 1.2 mm each cycle. What is the coefficient of friction between the block and the surface?	[06]
Q3 (a)	A motor car Moving with a speed of 100km/hr. has a gross mass of 1500kg. It passes over a rough road which has a sinusoidal surface with an amplitude of 75mm and wavelength of 5m. The Suspension system has a spring constant of 500 N/mm and damping ratio of 0.5. Determine the displacement amplitude of car and time lag.	[10]
Q3 (b)	i) Explain salient features of frequency response curve and phase frequency curve.	[05]
	OR	
	ii) Explain the term magnification factor and obtain expression for it.	[05]
Q4 (a)	i)Four masses A, B, C, D are completely balanced. Masses C and D makes angle of 90 Deg. and 210 Deg. respectively with B in same sense. The Planes containing B and C are 300 mm apart. Masses A, B, C, D, can be assumed to be concentrated at radii of 360, 480, 240 and 300 mm respectively. The masses B, C and D are 15kg, 25kg, and 20kg respectively. Determine-1. The mass of A and its angular position, 2. The position of planes A and D.	[10]
	OR	
	ii)A four cylinder in line engine running at 2000 rpm is having crank and connecting rod lengths of 60 mm and 240 mm respectively. The mass of reciprocating part of each cylinder is 2 kg. The cylinders are spaced 160mm apart and the crank appears at 90 Deg. Intervals in an end view. If the firing order of the engine is 1-4-2-3, determine 1. The unbalance primary and secondary forces ,2. The unbalance primary and secondary couples.	[10]
Q4 (b)	What is the function of a vibration isolator? Also write a note on commercial isolator material.	[05]
Q5 (a)	A spring-mass-damper system, having an undamped natural frequency of 100 Hz and a damping constant 20 N-s/m, is used as an accelerometer to measure the vibration of a machine operating at a speed of 3000 r.p.m.,if the actual acceleration is 10 m/s^2 and recorded acceleration is 9 m/s^2, find the mass and spring constant of the accelerometer.	[10]
Q5 (b)	i)What do you mean by vibration monitoring of machine? List various types of vibration monitoring techniques.	[05]
	OR	
	ii)Draw and explain the Response Curve of Vibration Measuring Instrument .	[05]

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