BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION MO/2024)

CLASS: BTECH **SEMESTER : V**
BRANCH: MECHANICAL **SESSION : MO/2024**

SUBJECT: ME303 MECHANICAL VIBRATION

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	Explain the term 'Logarithmic decrement' as applied to damped vibrations.	[2]	1,5	2
Q.1(b)	Determine the natural frequency of the system shown in Figure 1. The point A (where the ends of the springs are attached to the cylinder) is at a distance a vertically above the center. The cylinder rolls without slip from its equilibrium position.	[3]	1,3,5	3

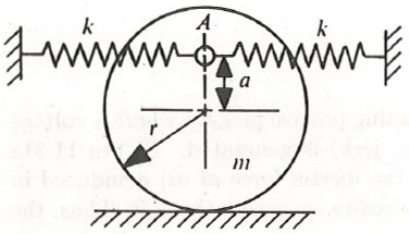

Figure 1

Q.2(a)	Explain 'Transmissibility ratio' of a spring, mass, damper system subjected to harmonic force excitation.	[2]	1	2
Q.2(b)	A machine of mass m = 200 kg is supported on two mounts, each of stiffness k = 10 kN/m as shown in Figure 2. The machine is subjected to an external force (in N) $F(t)$ = 50 cos 5t. Assuming only vertical translatory motion, determine the magnitude of the dynamic force (in N) transmitted from each mount to the ground.	[3]	1, 5	3

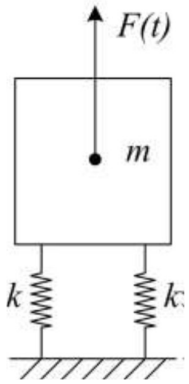

Figure 2

PTO

Q.3(a)	Explain different types of 'Coordinate coupling' in two degrees of freedom system of vibrations.	[2]	1,2	2
Q.3(b)	Write the equations of motion for the system shown in Figure 3, and determine its natural frequencies.	[3]	1,2,3,5	3

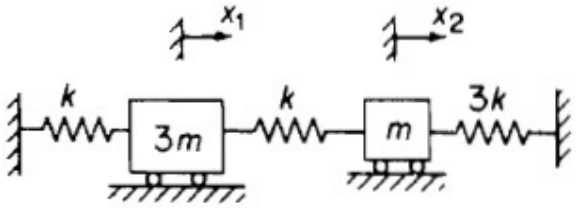

Figure 3

Q.4(a)	Explain flexible and stiffness influence coefficients for a multi degree of freedom system.	[2]	1,2	2
Q.4(b)	Derive the flexibility matrix for the spring-mass system shown in Figure 4.	[3]	1,2,5	6

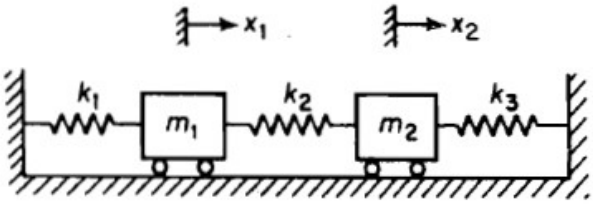

Figure 4

Q.5	Derive the orthonormal normal modes and corresponding modal matrix for the spring-mass system shown in Figure 3.	[5]	1,2,3,5	6

::::::19/09/2024::::::M