Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – WINTER 2018

Subject Code:2161901 **Date:07/12/2018**

Subject Name:Dynamics of Machinery

Time: 02:30 PM TO 05:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Define following term: (i) Degree of Freedom (ii) Damping (iii) Resonance	**03**
	(b)	Explain the balancing of several masses rotating in same plane by Graphical Method.	**04**
	(c)	Why is balancing of rotating parts necessary for high speed engines? Explain clearly the terms static balancing and dynamic balancing. State the necessary conditions to achieve them.	**07**
Q.2	**(a)**	What is meant by critical speed of a shaft? Which are the factors affecting it?	**03**
	(b)	How and why are reciprocating masses balanced in a piston-cylinder assembly? Why reciprocating masses are partially balanced?	**04**
	(c)	The four masses A, B, C and D revolve at equal radii are equally spaces along the shaft. The mass B is 7 kg and radii of C and D makes an angle of 90° and 240° respectively (counterclockwise) with radius of B, which is horizontal. Find the magnitude of A, C and D and angular position of A so that the system may be completely balance. Solve problem by analytically.	**07**
		OR	
	(c)	A single cylinder reciprocating engine has speed 240 rpm, stroke 300 mm, mass of reciprocating parts 50 kg, mass of revolving parts at 150 mm radius 30 kg. If all the mass of revolving parts and two-third of the mass of reciprocating parts are to be balanced, find the balance mass required at radius of 400 mm and the residual unbalanced force when the crank has rotated 60° from IDC.	**07**
Q.3	**(a)**	Explain briefly energy method to find out characteristic equation for free vibration of single degree of freedom system.	**03**
	(b)	Explain and Derive an expression for critical speed of a shaft carrying rotor and without damping.	**04**
	(c)	Discuss different cases showing the characteristics of the system performance for a damped free vibration	**07**
		OR	
Q.3	**(a)**	Write short note on “Torsionally equivalent shaft”	**03**
	(b)	Define (1) Time Period (2) Stiffness of Spring (3) Periodic motion (4) Equivalent Damper in series.	**04**
	(c)	A mass of 20kg is supported on two isolators as shown in fig. (a) Determine the undamped and damped natural frequencies of the system, neglecting the mass of the isolators.	**07**
Q.4	**(a)**	Write a short notes on “Frequency Response Curve”	**03**
	(b)	Define force transmissibility. Explain with neat sketch transmissibility curves.	**04**

	(c)	A 40 kg machine is supported by four springs each of stiffness 250 N/m. The rotor is unbalanced such that the unbalance effect is equivalent to a mass of 5 kg located at 50mm from the axis of rotation. Find the amplitude of vibration when the rotor rotates at 1000 rpm and 60 rpm. Assume damping coefficient to be 0.15	**07**

OR

Q.4	**(a)**	Explain Vibration Isolation, What are the various materials used for vibration isolation?	**03**
	(b)	What is damped vibration? What are the different types of damping methods?	**04**
	(c)	Estimate the approximate fundamental natural frequency of the system shown in Fig. (b) Using Rayleigh's method. Take: m=1kg and K=1000 N/m.	**07**
Q.5	**(a)**	What are the various sources of external excitations?	**03**
	(b)	Define logarithmic decrement and derive an expression for it?	**04**
	(c)	The damped vibration record of a spring-mass-dashpot system shows the following data. Amplitude on second cycle = 0.012m; Amplitude on third cycle = 0.0105m; Spring constant k = 7840 N/m; Mass m = 2kg. Determine the damping constant, assuming it to be viscous.	**07**

OR

Q.5	**(a)**	Define following terms: Zero frequency and Node point.	**03**
	(b)	Why the measurement of vibration is necessary? What do you mean by vibration monitoring of machine? Enlist different vibration measuring instruments.	**04**
	(c)	Explain Jump phenomenon and cross over shock in case of cam and follower	**07**

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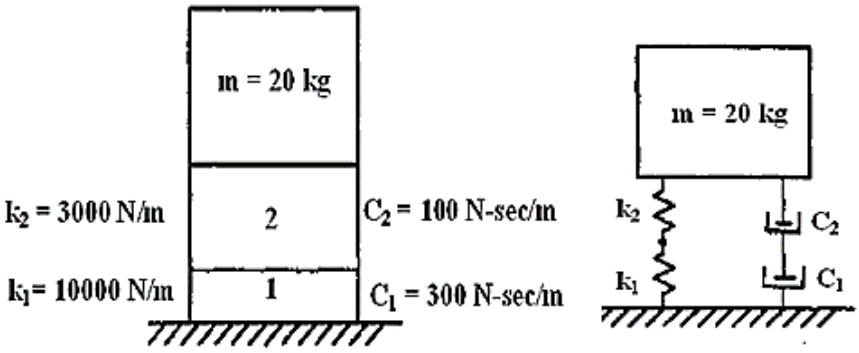

Fig (a) – Que : 3 C (OR)

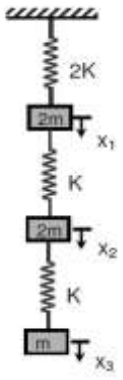

Fig (b) – Que : 4 C (OR)