Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–VI EXAMINATION – WINTER 2015

Subject Code:X61902 **Date:12/12/2015**

Subject Name: Dynamics of Machinery

Time: 02:30pm to 05:00pm **Total Marks: 70**

Instructions:

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

Q.1	(a)	Write a short note on torsional equivalent shaft	07
	(b)	Derive the expression to determine the natural frequency of free torsional vibrations of a 'geared system' in standard notations.	07
Q.2	(a)	Derive the natural frequency for free vibration using equilibrium and energy method	07
	(b)	Two rotors, A and B are attached to the ends of the shaft 600 mm long. The mass and radius of gyration of rotor A is 40 kg and 400 mm respectively and that of rotor B are 50 kg and 500 mm respectively. The shaft is 80 mm diameter for first 250 mm, 120 mm for next 150 mm and 100 mm for the remaining length from the rotor A. Assume the modulus of rigidity of the shaft material 0.8×10^5 N/mm^2. Find the position of node on equivalent shaft of diameter 80 mm and on the actual shaft. Also find the natural frequency of the torsional vibrations.	07
		OR	
Q.2	(b)	Determine the natural frequency of oscillation of the simple pendulum considering the mass of the rod.	07
Q.3	(a)	Define the logarithmic decrement and derive an expression for it?	07
	(b)	A machine weight 18kg and is supported on spring and dashpots. The total stiffness of springs is 12N/mm and damping co-efficient is 0.2N-s/mm. The system is initially at rest and a velocity of 120mm/s is imparted to the mass. Determine: The displacement and velocity of mass as a function of time	07
		OR	
Q.3	(a)	Draw a frequency Response curve for different damping conditions. Also write observation made from frequency response curve	07
	(b)	What is vibration isolation? What are the various types of isolating materials used for isolation?	07
Q.4	(a)	What do you mean by critical speed of shaft? State its significance	07
	(b)	A shaft carries four masses A, B, C and D of magnitude 200 kg, 300 kg,400 kg and 200 kg respectively and revolving at radii 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the cranks measured anticlockwise are A to B 45°, B to C 70° and C to D 120°. The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions.	07
		OR	
Q.4	(a)	Derive the following expressions, for an uncoupled two cylinder locomotive engine : (*a*) Variation is tractive force ; (*b*) Swaying couple ; and (*c*) Hammer blow.	07

	(b)	An inside cylinder locomotive has its cylinder centre lines 0.7 m apart and has a stroke of 0.6 m. The rotating masses per cylinder are equivalent to 150 kg at the crank pin, and the reciprocating masses per cylinder to 180 kg. The wheel centre lines are 1.5 m apart. The cranks are at right angles. The whole of the rotating and 2/3 of the reciprocating masses are to be balanced by Masses placed at a radius of 0.6 m. Find the magnitude and direction of the balancing masses. Find the fluctuation in rail pressure under one wheel, variation of tractive effort and the magnitude of swaying couple at a crank speed of 300 r.p.m.	07
Q.5	(a)	The reciprocating mass per cylinder in a 60° V-twin engine is 1.5 kg. The stroke and connecting rod length are 100 mm and 250 mm respectively. If the engine runs at 2500r.p.m., determine the maximum and minimum values of the primary and secondary forces. Also find out the crank position corresponding these values.	07
	(b)	Explain with neat sketch Dynamic balancing machine	07
		OR	
Q.5	(a)	What do you understand by partial balancing of locomotives	07
	(b)	Explain the working principle with neat sketch Frequency measuring instruments?	07

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