Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC-SEMESTER–VI EXAMINATION – Winter 2016

Subject Code: X61902 **Date:26/10/2016**

Subject Name: Dynamics of Machinery

Time:10.30 am - 01.00 PM **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)**	Define the following terms: (i) Balancing (ii) Swaying Couple (iii) Periodic Motion (iv) Degree of Freedom (v) Damping Ratio (vi) Logarithmic Decrement (vii) Dynamic Magnification Factor	**07**
	(b)	1) "Single cylinder reciprocating engine can not be balanced completely" – Discuss.	**03**
		2) Explain clearly the terms static balancing and dynamic balancing. State the necessary conditions to achieve them.	**04**
Q.2	**(a)**	Discuss the balancing of V-engine and derive the necessary relationship/s in standard notations.	**07**
	(b)	A single cylinder reciprocating engine has reciprocating parts of mass 30 kg and revolving parts of mass 50 kg at 150 mm of crank radius. If whole of the revolving mass and two-third of the reciprocating mass 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 and engine runs at 240 rpm.	**07**
		OR	
	(b)	A shaft carries four masses *A*, *B*, *C* and *D* spaced 600 mm apart at radii 100 mm, 125 mm, 150 mm and 200 mm respectively. The masses *B*, *C* and *D* are 10 kg, 5 kg and 4 kg respectively. Find the required mass *A*, and the relative angular positions of the four masses for the complete balance of the system.	**07**
Q.3	**(a)**	Derive the natural frequency relationship for the torsional pendulum with standard notations.	**07**
	(b)	A mass of body of free-damped system is 16 kg which makes 45 oscillations in 27 seconds. The amplitude of free vibration decreases to one-fourth of the initial value after 5 complete oscillations. Determine (i) logarithmic decrement (ii) damping factor (iii) stiffness and (iv) damping coefficient of the system.	**07**
		OR	
Q.3	**(a)**	What are the different types of damping models used in actual practice? Discuss about (i) over damping (ii) critical damping and (iii) under damping. Also draw the plots of amplitude versus time for the different damping conditions.	**07**
	(b)	A shaft of length 600 mm carries two rotors, *A* and *B* at its ends. 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*. Find the natural frequency of the torsional vibrations and the position of node. Assume the modulus of rigidity of the shaft material 0.8×10^5 N/mm^2.	**07**
Q.4	**(a)**	Discuss about the vibration isolation and force transmissibility. List out the different types of vibration isolating materials used with their characteristics.	**07**
	(b)	A shaft 40 mm diameter and 2.5 m long is simply supported at the ends carries three rotors of mass 90 kg, 140 kg and 60 kg at 0.8 m, 1.5 m and 2 m from the left support. The modulus of elasticity of the shaft material is 2×10^5 MPa. Estimate the critical speed of the shaft by using Dunkerley's method.	**07**

OR

Q.4	**(a)**	Derive the generalized equation of transverse vibrations of a beam of uniform cross section carrying uniformly distributed load with usual notations.	**07**
	(b)	A machine of mass 1000 kg is mounted on the foundation with an elastic support having stiffness of 2000 kN/m and equivalent viscous damping coefficient of 1050 Ns/m. The machine is subjected to an external disturbing force of 600 N at the frequency of 6π Hz. Determine the amplitude of vibration of the machine and force transmitted to the foundation.	**07**
Q.5	**(a)**	Explain the working principle of a vibrometer and an accelerometer with the neat sketches stating their applications.	**07**
	(b)	Two simple pendulums are connected in series. Derive the natural frequency relationship for the same in standard notations.	**07**

OR

Q.5	**(a)**	What is the importance of vibration measurement? Write a short note on frequency measurement.	**07**
	(b)	What are the reasons of vibrations in the system? How the effects of vibrations can be reduced or eliminated? List out the adverse effects of the vibrations. Also discuss about the applications of vibrations.	**07**

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