Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–VI • EXAMINATION – SUMMER • 2015

Subject code: X61902 Date: 12/05/2015

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)**	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 with help of tabulated and graphical method.	**07**
	(b)	Why balancing is necessary in high speed engines? Explain static and dynamic balancing with necessary conditions.	**07**
Q.2	**(a)**	Derive the equation for swaying couple. Also explain hammer blow.	**07**
	(b)	Write a short note on primary and secondary balancing	**07**
		OR	
	(b)	The cranks and connecting rods of a 4-cylinder in-line engine running at 1800 r.p.m. are 60 mm and 240 mm each respectively and the cylinders are spaced 150 mm apart. If the cylinders are numbered 1 to 4 in sequence from one end, the cranks appear at intervals of 90° in an end view in the order 1-4-2-3. The reciprocating mass corresponding to each cylinder is 1.5 kg. Determine : 1. Unbalanced primary and secondary forces, if any, and 2. Unbalanced primary and secondary couples with reference to central plane of the engine.	**07**
Q.3	**(a)**	Explain clearly the terms " static balancing" and "dynamic balancing". State the necessary conditions to achieve them.	**07**
	(b)	Explain the method of balancing of different masses revolving in the same plane.	**07**
		OR	
Q.3	**(a)**	Define, in short, free vibrations, forced vibrations and damped vibrations.	**07**
	(b)	Discuss the effect of inertia of the shaft in longitudinal and transverse vibration.	**07**
Q.4	**(a)**	A cantilever shaft 50 mm diameter and 300 mm long has a disc of mass 100 kg at its free end. The Young's modulus for the shaft material is	**07**

200 GN/m2. Determine the frequency of longitudinal and transverse vibrations of the shaft.

(b) A shaft 50 mm diameter and 3 meters long is simply supported at the ends and carries three loads of 1000 N, 1500 N and 750 N at 1 m, 2 m and 2.5 m from the left support. The Young's modulus for shaft material is 200 GN/m2. Find the frequency of transverse vibration. **07**

OR

Q.4 **(a)** Explain: Critical or Whirling Speed of a Shaft. **07**

(b) What do you understand by transmissibility? **07**

Q.5 **(a)** Derive an expression for the frequency of free torsional vibrations for a shaft fixed at one end and carrying a load on the free end. **07**

(b) How the natural frequency of torsional vibrations for a two rotor system is obtained? **07**

OR

Q.5 **(a)** Discuss the effect of inertia of a shaft on the free torsional vibrations. **07**

(b) Establish the expression to determine the frequency of torsional vibrations of a geared system. **07**

****