Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E SEM-VII Examination-Nov/Dec.-2011

Subject code: 171802 **Date: 22/11/2011**

Subject Name: Mechanics of Machine- II

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)**	Explain epicyclic gear train. Obtain velocity ratio of epicyclic gear train by tabular method.	**07**
	(b)	State and explain law of gearing.	**07**
Q.2	**(a)**	Explain balancing of single rotating mass by a single mass rotating in the same plane.	**07**
	(b)	Explain balancing of secondary forces of multi cylinder in line engine.	**07**
		OR	
	(b)	Explain balancing of several masses rotating in different planes.	**07**
Q.3	**(a)**	What do you under stand by gyroscopic couple ? derive an expression for it.	**07**
	(b)	The mass of turbine rotor of a ship is 20 tonnes and has a radius of gyration of 0.6m. Its speed is 2000 rpm. The ship pitches 6° above and 6° below the horizontal position. A complete oscillation takes 30 seconds and the motion is simple harmonic. Determine the following: (1) maximum gyroscopic couple (2) maximum angular acceleration of the ship during pitching and (3) direction in which the bow will tend to turn when rising, if the rotation of the rotor is clockwise when looking from the front.	**07**
		OR	
Q.3	**(a)**	Explain: (1) viscous damping (2) damping ratio and (3) logarithmic decrement.	**07**
	(b)	An instrument vibrates with a frequency of 1 Hz when there is no damping. When damping is provided, the frequency of damped vibrations was observed to the 0.9 Hz. Find: (1) damping factor and (2) logarithmic decrement	**07**
Q.4	**(a)**	Explain with neat sketch : (1) longitudinal vibration (2) transverse vibration and (3) torsional vibration	**07**
	(b)	Derive an expression for natural frequency of free longitudinal vibration using equilibrium method.	**07**
		OR	
Q.4	**(a)**	Write a short note on critical speed of shaft and show that critical speed (expressed in r.p.s.) is same as the natural frequency of transverse vibration.	**07**

Q.4	**(b)**	Calculate the whirling speed of a shaft 20 mm diameter and 0.6 m long carrying a mass of 1 kg at its mid point. The density of the shaft material is 40 x 10^3 kg/m^3, and Young's modulus of elasticity is 200 GN/m^2. Assume the shaft to be freely supported.	**07**
Q.5	**(a)**	Discuss the free torsional vibration of a two rotor system. Explain how the position of node is obtained for it.	**07**
	(b)	What do you understand by torsionally equivalent shaft. Deduce the expression for it.	**07**

OR

Q.5	**(a)**	Derive an expression for natural frequency of free transverse vibration for a simply supported beam carrying a number of point load and uniformly distributed load by Dunkerley's method.	**07**
	(b)	A shaft 50 mm diameter and 3 meter lomg is simply supported at the ends and carries three loads of 1000N, 1500N and 750N at 1m, 2m and 2.5m from the left support. The Young's modulus of elasticity for shaft material is 200 GN/m^2. Find frequency of transverse vibration.	**07**

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