Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013

Subject Code: 710902N **Date: 26-12-2013**

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)**	Formulate the mathematical model of the cam and follower system considering their elasticity.	**07**
	(b)	What do you mean by 'Automatic Control System'? Explain with example the term 'Adaptive Control'.	**07**
Q.2	**(a)**	Discuss about the 'Auto-correlation' function and their properties.	**07**
	(b)	A simply supported beam of length 2.5 m, is subjected to three point loads of 45 kg, 70 kg and 30 kg at 0.8 m, 1.5 m and 2 m respectively from one of its ends. The modulus of elasticity of the beam material is 2×10^5 Mpa and second moment of its cross-section area about its neutral axis is 0.1257×10^{-6} m^4. Determine the frequency of the transverse vibrations of the beam by using Dunkerley's method.	**07**
		OR	
	(b)	Explain with suitable example the Johnson's numerical analysis used for cam-follower system.	**07**
Q.3	**(a)**	What is the significance of the transfer function of the control system? Obtain the inverse Laplace transform of the following transfer functions: (i) $\frac{2s+5}{s(s+4)}$ (ii) $\frac{s+6}{s(s^2+4s+3)}$	**07**
	(b)	Write a short note on 'Noise Measurement and Control'.	**07**
		OR	
Q.3	**(a)**	A single cylinder vertical petrol engine of total mass 200 kg is mounted upon a steel chassis frame. The vertical static deflection of the frame is 2.4 mm due to the weight of the engine. The reciprocating parts of the engine have a mass of 9 kg and move through a vertical stroke of 160 mm with SHM. A dashpot is provided with a damping resistance of 1000 N-s/m. Determine the speed of the driving shaft at which the resonance will occur and the amplitude of steady state vibrations when driving shaft of the engine runs at 500 rpm.	**07**
	(b)	With neat sketch, explain the 'Phase Plane Method' for analysis of the jump phenomenon for cam-follower system.	**07**
Q.4	**(a)**	Discuss about the stability of the system whose characteristic equation is given as $3s^7+9s^6+6s^5+4s^4+7s^3+8s^2+2s+6=0$, by Routh criteria.	**07**
	(b)	State and justify the assumption/s and consideration/s made for deriving the governing equation of acoustic sound wave.	**07**
		OR	
Q.4	**(a)**	By using the standard notations, derive an equation of motion of the torsional vibrations of a continuous shaft of uniform cross-section.	**07**
	(b)	State the common techniques used for noise and vibration control and explain briefly any one from each of them.	**07**
Q.5	**(a)**	Explain the different terms involved in case of 'Root Locus Technique' with suitable example and neat sketch/s.	**07**

	(b)	Derive the suitable expression of transverse vibration for Fixed-Free beam of length *l* with uniform cross section and carrying a uniformly distributed load in usual notations.	**07**

OR

Q.5	**(a)**	What you mean by 'Stability' of the control system? Explain any one of the criteria used for stability investigation.	**07**
	(b)	Explain the following terms: vibration isolation and force transmissibility.	**07**

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