GUJARAT TECHNOLOGICAL UNIVERSITY M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2013

Subject code: 710902N Subject Name: Dynamics of Machinery Time: 10.30 am – 01.00 pm Instructions:

Date: 04-06-2013

Total Marks: 70

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- Q.1 (a) Obtain the conditions for the magnification factor for the force 07 transmissibility and motion transmissibility for a single degree of freedom system. Also draw their frequency response curve.
 - (b) Determine the natural frequencies and mode shapes of the system 07 shown in figure below by matrix inversion method.



Q.2 (a) Find the longitudinal natural frequencies of a bar as shown in figure 07 below:



	(b)	Explain the following (i) Octave (ii) Antiresonance (iii) Piston phone	07
		OR	
	(b)	any two of them.	07
Q.3	(a)	Explain the following in detail: (1) Jumping speed, (2) Spring surge and (3) Wind up.	07
		Also explain different factors which affect the jumping speed.	
	(b)	List out classical methods and approximate methods for the vibration analysis and explain one method from each.	07
		OR	
Q.3	(a)	Derive the expression for the jumping speed of non rigid cams.	07
	(b)	Determine the normal functions in transverse vibration for a simply supported beam of length l and uniform cross section	07
Q.4	(a)	The characteristic equation for certain feedback control system are given below. In each case, determine the range of values of K for the system to be stable.	07
		$S^4 + 20KS^3 + 5S^2 + 10S + 15 = 0$	
	(b)	What do you mean by Control system? Explain liquid level controller of first order with a neat sketch.	07

- Q.4 (a) Obtain the Laplace transforms of the following: 1. $e^{-3t} (2\cos 5t - 3\sin 5t)$ 2. $e^{3t} \sin^2 t$ 3. $e^{4t} \sin 2t \cos t$
- Q.4 (b) The forward path transfer function of a unity feedback system is given 07 by

$$G(s)H(s) = \frac{K}{s(s+6)(s^2+4s+13)}$$

Sketch the root locus as *K* varies from zero to infinity.

Q.5 (a) Obtain the overall system function for a mathematical model for the 07 system shown in following figure.



(b) Explain Nyquist criteria giving one suitable example. 07

07

Q.5 (a) Discuss the stability criteria and explain different types of stabilities.
(b) The forward path transfer function of a unity feedback system is given 07 by

$$G(s)H(s) = \frac{K}{s(s+2)(s+4)}$$

Sketch the root locus as *K* varies from zero to infinity.
