Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – III • EXAMINATION – SUMMER • 2014

Subject code: 734703 Date: 05-06-2014

Subject Name: Dynamics of Machines

Time: 02:30 pm - 05:00 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)**	Write a short note on free and forced vibrations giving engineering examples with neat sketches.	**07**
	(b)	How the equivalent stiffness of following systems is decided? (1)parallel springs (2)series springs (3)geared torsional system. Support your answer with neat sketches.	**07**
Q.2	**(a)**	Explain a phase plane method to determine the response of a single degree of freedom system due to sudden disturbance with an example.	**07**
	(b)	Write a brief note with related equations on ôViscous dampingô giving example.	**07**
		OR	
	(b)	What is ôLogarithmic decrementô? Explain with related equations and neat sketch.	**07**
Q.3	**(a)**	A reciprocating pump 200 kg is driven through a belt by an electric motor at 3000 rpm.The pump is mounted on isolators with total stiffness 5 MN/m and damping 3.125 kNs/m. Determine the vibratory amplitude of the pump at running speed due to fundamental harmonic force of excitation 1 KN.Also determine the maximum vibratory amplitude when the pump is switched on and motor speed passes through resonant condition.	**07**
	(b)	Derive the equations of motions for a machine mounted on elastically supported damper (Voight model) giving free body diagrams.	**07**
		OR	
Q.3	**(a)**	A 3 tonne machine mounted on isolators with an elastically coupled viscous damper has stiffness K=2.943 MN/m.The damping constant is 56.4 kNs/m and stiffness ratio K/K_1=0.5.The machine develops a harmonic force of 1 KN at an excitation frequency of 7 Hz. (a) Determine its amplitude.(b)Assume that the excitation force remains constant with the operating speed and determine maximum amplitude of machine and corresponding excitation frequency.	**07**
	(b)	A two degree of freedom system has two masses m_1 and m_2 tied to the ground through springs K_1 and K_3 respectively and coupled through spring K_2.Derive equation of motion assuming free undamped vibrations. Show the free body diagrams with neat sketch.	**07**
Q.4	**(a)**	Write a short note on ôDegenerated Systemô.	**07**
	(b)	Briefly explain vibration absorber and vibration isolators.	**07**
		OR	
Q.4	**(a)**	Write a short note on ôModal analysisô with reference to multi degree freedom system.	**07**
	(b)	What is Dunkerleyôs method to estimate fundamental frequency of a system? Explain in brief.	**07**

Q.5	**(a)**	What is meant by aô continuous systemõ? Briefly explain giving examples. How vibrations of such systems are studied?	**07**
	(b)	What are the basic elements of a vibration measurement system? Explain with neat sketch.	**07**

OR

Q.5	**(a)**	Sketch the natural frequency mode shapes of beams with various end conditions.	**07**
	(b)	Write a short note on öRandom vibrations ôgiving examples.	**07**

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