Seat No.: \_\_\_\_\_

Enrolment No.\_\_\_\_\_

## **GUJARAT TECHNOLOGICAL UNIVERSITY** ME – SEMESTER III (OLD) – • EXAMINATION – SUMMER 2016

Subject Code: 734703

Date: 05/05/2016

Time:10:30 am to 01:00 pm Instructions:

**Total Marks: 70** 

1. Attempt all questions.

**Subject Name: Dynamics of Machines** 

- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- Q:1 Find the natural frequency and mode shapes of a spring mass system, 14 shown in the following figure. Also Solve the problem with matrix method considering eigenvalue problem.



- Q:2 (a) Explain the concept of modal analysis to determine the vibration response 07 of multi degree of freedom system to general excitation.
  - (b) Determine the natural frequencies of vibrations of uniform beam fixed at 07 x = 0 and simply supported at x = l.

## OR

- (b) Find the natural frequencies of a bar with one end fixed and a mass M is 07 attached at the other end (at x = l)
- Q:3 (a) Explain the Dunkerleyøs method and Rayleighøs method to determine the 07 approximate value of fundamental natural frequency of multi degree of freedom system.
  - (b) Explain the Lagrange equations to derive the equation of motion for 07 multi degree of freedom system with suitable example.

## OR

Q:3 (a) A damped spring mass system with values of c = 100 kg/s, m = 100 kg, 07 and k = 910 N/m, is subjected to a force of  $10\cos(3t)$  N. The system is also subject to initial condition  $x_0 = 1 \text{ mm}$ , and  $v_0 = 20 \text{ mm/s}$ . Compute the total response x(t), of the system.

- (b) A small sport car is modeled as a single degree of freedom system. The 07 car has mass of m kg, equivalent stiffness of k N/m and damping of c kg/s of four shock absorber systems. The car deflects the suspension system 0.05 m under its own weight. The suspension is chosen to have damping ratio of 0.3. (a) If the car has mass of 1361 kg, calculate the equivalent damping and stiffness coefficients of suspension system. (b) If two passengers, a full gas tank and luggage totaling 290 kg are in the car, how does this affect the damping ratio?
- Q:4 Derive the expression to determine the response of damped free and 14 forced vibration of single degree of freedom system.

## OR

Q:4	<b>(a)</b>	<ul><li>Find the coefficient of damping for following cases:</li><li>1. Viscous dampers for linear motion</li></ul>	07
	(b)	2. Viscous dampers for angular motion Discuss the vibration isolation and force transmissibility.	07
Q:5	<b>(a)</b>	Explain the random vibrations, correlation and spectral density.	07
	(b)	Explain the different types of instruments those are used in conducting the vibration tests.	07
		OR	
Q:5	<b>(a)</b>	Explain the free vibration test and force vibration test.	07
	(b)	Derive the equation of motion for valve mechanism of IC engine.	07

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