

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2014

Subject code: 712002N**Date: 17-06-2014****Subject Name: Structural Dynamics****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) Discuss in detail the various methods of finding out the damping ratio by experimental work. **07**
 (b) Discuss the various methods of creating damping matrix for the multi-degree freedom system. **07**
- Q.2** (a) Discuss in detail the damped force-free vibrations. Derive the equation of the motion for the system having initial displacement x_0 and initial velocity v_0 . **07**
 (b) A single spring mass unit has mass of 4000kg, damping ratio 5% and spring constant of 50kN/m. Calculate the value of 1) natural frequency, 2) damped frequency 3) damping constant 4) equation of the motion if the initial displacement is 5mm. Also calculate the time required to reduce its amplitude to 1mm. **07**
- OR**
- (b) A single spring mass unit has mass of 6t, damping constant of 4kN-sec/m and spring constant of 60kN/m. Calculate the equation of the motion of the mass when the mass is given initial displacement of 10mm and initial velocity of 30 mm/sec. Hence calculate the initial amplitude of the motion and amplitude of the motion after 5 cycles. **07**
- Q.3** A simple support beam having span of 8m and is excited by a machine exerting force of $20 \sin(20t)$ kN at the midpoint of the beam. If the unit mass of the beam is 3000 kg/m and the flexural rigidity of the beam is 30000kN-m², obtain the equation of the motion of the midpoint of the beam by any method. **14**
- OR**
- Q.3** For cantilever beam has span of 6m, flexural rigidity of 20000kN-m² and self mass of 500kg/m. Calculate the equation of the motion if the tip is displaced by 3mm and left to vibrate by fourth order differential equation method. **14**
- Q.4** A single spring mass system has mass of 200t and spring stiffness of 8000kN/m is loaded by an impulsive load as shown in the figure.1. Calculate the equation of the motion after the total time period of the impulse. **14**

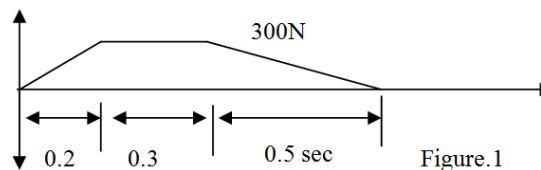
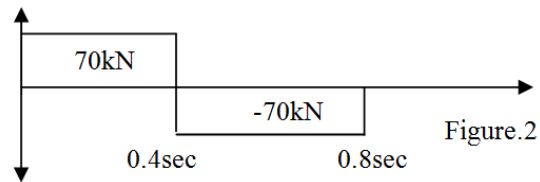


Figure.1

OR

- Q.4** A single spring mass system has mass of 200kg, damping ratio 5% and spring stiffness of 15kN/m is loaded by a periodic load for which one period is as shown in the figure.2. Calculate the equation of the steady state of the motion. **14**



- Q.5** A multi degree freedom system is as shown in the figure.2. If the 300kg and 50kg masses are displaced to right by 8mm and 16mm from their steady position respectively and left to vibrate, calculate the equation of the motion of the masses. **14**

OR

- Q.5** A multi degree freedom system is as shown in the figure.3. If the 300kg and 50 kg masses are acted upon by force of $0.05 \cdot \sin(6t)$ N and $0.05 \cdot \sin(10t)$ N respectively towards right of the mass, calculate the equation of the steady state motion for the masses. **14**

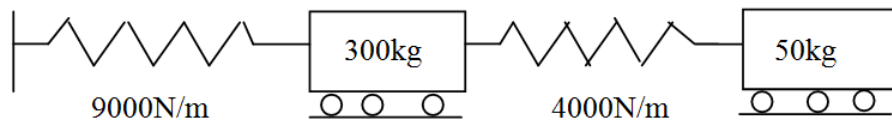


Figure.3
