

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. IST Semester–Remedial Examination – July- 2011

Subject code: 712002N

Subject Name: Structural Dynamics

Date: 08/07/2011

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) Write the differential equilibrium equation and explain each component of the equation. Also explain the fundamental difference between damped and undamped systems. **07**
- (b) Explain the principles underlying numerical integration. Write a note on various time stepping methods. **07**

- Q.2** (a) Explain lumped mass systems and justify their use in dynamic analysis of tall structures. **07**
- (b) Derive the equation of motion of the weight W suspended from a spring at the free end of a cantilever steel beam of length 250mm. The steel beam has a circular cross-section with 50mm diameter. Assume E for steel = 200000 MPa. And stiffness of the spring = 20 N/mm. Neglect the mass of the beam and the spring. **07**

OR

- (b) Write a note on vibration measurement devices and explain the principle of a simple transducer. **07**
- Q.3** (a) Explain the significance of torsion induced on the entire structure due to earthquakes. Also describe the measures that may be adopted in order to avoid or minimize the earthquake induced torsion. **07**
- (b) Explain under-damped, critically damped and over-damped systems. **07**

OR

- Q.3** (a) Write a note on response spectrum analysis. Explain its advantages and disadvantages over the seismic coefficient method prescribed by the codes. **07**
- (b) Earthquakes excitations have 3 components of motion, viz u_x , u_y and u_z . The vertical component of vibration is often ignored in analysis. Highlight the importance of all the three components of ground motion and cite when it would be critical to consider the vertical component of vibration. **07**

- Q.4** (a) Explain distributed mass systems and compare it with the lumped mass systems by giving merits and demerits of both the approaches. **07**
- (b) A uniform cantilever tower of length L has mass per unit length = m and flexural rigidity EI . Assuming the shape function $\psi(x) = 1 - \cos(\pi x/2L)$. Formulate the equation of motion for the system excited by ground motion and determine its natural frequency. **07**

OR

- Q.4** (a) Write a note on shear walls and highlight their importance. **07**
(b) In multi-storeyed buildings, often richer concrete and more steel is provided in the columns on higher floors than lower floors. Is the statement true? Justify your answer with appropriate sketches and arguments. **07**

- Q.5** (a) Write a note on isolated foundation system. **07**
(b) Explain active and passive damping devices. **07**

OR

- Q.5** (a) Write a note on friction devices. **07**
(b) Describe the procedure of push-over analysis of a multi-storeyed frame. **07**
