

MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL

**VII SEMESTER B.TECH. (CIVIL ENGINEERING) END SEMESTER EXAMINATIONS, NOV/DEC 2016** 

## SUBJECT: ELEMENTS OF EARTHQUAKE RESISTANT DESIGN OF **STRUCTURES** [CIE 405]

### **REVISED CREDIT SYSTEM**

#### (28/11/2016)

Time: 3 Hours

MAX. MARKS: 50

#### **Instructions to Candidates:**

- ✤ Answer ANY FIVE FULL questions.
- ✤ Missing data may be suitable assumed.

1A. 1B.	With a neat sketch explain the working principle of Friction dampers? Explain how	5
	earthquake shaking reverses tension and compression in members.	•
	How do structures with unequal vertical members cause twist about its vertical axis? Explain	5
	the failure of a structure due to mass eccentricity	Ŭ
	Write short note on Composition matrix of FRP. What are the advantages and disadvantages	5
2A. 2B.	of Base isolation techniques?	5
	What is the basic criteria for strengthening of walls by RC jacketing? Briefly explain the	5
	different stages in the design of Earthquake resistant Reinforced Concrete buildings	5
3A.	Write a short note on (i) Cyclic mobility (ii) Rigid diaphragm action	5
3B.	Write a short note on (i) Cyclic mobility (ii) Rigid diaphragm action	5
4A.	Derive the differential equation of motion for the free vibration of an under damped SDOF system with the following initial boundary" conditions i) at $t = 0$ V(t) = V <sub>0</sub> and	
	$0 \qquad 0 \qquad 0$	5
	i) at $t = 0$ V(t) = V <sub>o</sub> and V (t) = V <sub>o</sub> ii) at $t = 0$ V(t) = Vo and V (t) = 0	
	and also draw response curve.	
4B.	Determine the displacement and velocity at 8.0 sec. if Vo $-60$ mm and $\stackrel{0}{V}_{0} = 0.3$ m/sec for the	5
	system shown in Fig. O4B.	U
5A.	A steel frame consisting of four legs, each a steel wide flange section W 250 x 35, supports a	
	rigid steel "table as shown in Fig. Q5A. A rotating motor with an unbalanced mass of 300 kg	
	at an eccentricity of 50 mm is mounted on the table. If the total mass of the table and the	5
	motor is 2900 kg find the flexural stress in the legs at operating speed of 1000 rpm. Assume	
	that the legs have a negligible mass and are fixed at the foundation as well as at the table.	
	Neglect damping. For each leg Ix= $30 \times 10^{\circ} \text{ mm}^{\circ}$ , Zx = $300 \times 10^{\circ} \text{ mm}^{\circ}$ and E= $320 \text{kN/mm}^{2}$	
5B.	An under damped SDOF system is subjected to an external harmonic force of Posin $\omega$ t. Derive	5
	an expression of response for initial condition at $t = 0$ V(t) = V <sub>0</sub> and $V(t) = 0$	•
	an expression of response for initial condition at $t = 0$ v(t) = v <sub>0</sub> and v (t)=0	

Reg. No.

10

# MANIPAL INSTITUTE OF TECHNOLOGY

A seven storied R.C.C framed building with live load of 3.5 kN/m<sup>2</sup> on floors is to be constructed in Guwahati on soft soil. Work out seismic forces on the structure. All beams and columns may be assumed to be 200mm x 450 mm and 500mm x 500 mm respectively. The roof and floor slabs may be assumed as 120 mm and 140 mm thick respectively. The walls are present on all of the wall is 200 mm. (Refer Fig. O6)

