Reg. No.



MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL

V SEMESTER B.TECH. (CIVIL ENGINEERING) END SEMESTER EXAMINATIONS, NOV/DEC 2017

SUBJECT: ELEMENTS OF EARTHQUAKE ENGINEERING [CIE 3105]

REVISED CREDIT SYSTEM

(/ /2017)

Time: 3 Hours

MAX. MARKS: 50

Instructions	to	Candidates:

✤ Answer ALL the questions.

* Use of **IS-1893:2002** and **IS-13920:1993** is permitted.

✤ Missing data may be suitably assumed.

What is seismology? Explain the instrument with a neat sketch to record earthquake.	4m
The free vibration decay curve of a system is shown in Fig.Q1B . If the stiffness of the spring is 150 N/m determine (i) Logarithmic decrement (ii) Damping ratio (iii) Damped frequency (iv) Undamped frequency (v) Mass (vi) Damping Coefficient (vii) Amplitude at 10 th cycle.	6m
 Derive the expression for free vibration response of an under damped SDOF system with the following initial boundary conditions, i) at t = 0 displacement is initial displacement and velocity is initial velocity. ii) at t = 0 displacement is initial displacement and velocity is zero. 	5m
Derive the expression for steady state amplitude of un-damped SDOF system subjected to Harmonic force of $F_{0.sin}(\omega t)$	5m
A machine of total mass 500 kg is mounted at the mid-span of simply supported beam of length 4m. The machine operating at 1200 rpm produces an unbalanced force of magnitude 400N. Determine the maximum bending stress produced in the beam. Take $E=2\times10^5$ N/mm ² . The beam is made up of symmetrical I-section of moment of inertia 11.55×10^6 mm ⁴ and the total depth of I beam section is 200mm. Take 10% damping	6m
Explain in detail (i) Role of horizontal bands in masonry structures (ii) Vertical irregularity of structures	4m
A six storied (G+5) RCC framed hospital building with live load of 4 kN/m ² is to be constructed in Lucknow. The Fig.Q4 shows plan and elevation of the structure. Work out seismic forces along the longer edge of the structure. All beams and columns may be assumed to be 300 mm x 500 mm and 300 x 600 mm respectively. The roof and floor slabs may be assumed to be 150 mm thick. Ignore floor finish. The walls of 230 mm thick are present on all floor beams except above the terrace. Take density of wall as 19 kN/m ³ . The soil below the foundation is assumed to be medium soil. Draw storey force and seismic shear force diagram.	10m
Derive equation of motion for the system shown in Fig.Q5A . All beams and columns may be assumed to be 230 mm x 450 mm and 550 x 550 mm respectively. Take Modulus of elasticity $E= 25000$ MPa.	5m
	What is seismology? Explain the instrument with a neat sketch to record earthquake.The free vibration decay curve of a system is shown in Fig.Q1B . If the stiffness of the spring is 150 N/m determine (i) Logarithmic decrement (ii) Damping ratio (iii) Damped frequency (iv) Undamped frequency (v) Mass (vi) Damping Coefficient



