Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

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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
(/ /2016)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitable assumed.
- Use of IS 1893 – 2002 is permitted

1A.	Explain any two methods of Seismic strengthening for existing structures. With a neat sketch explain the working principle of Fluid viscous dampers?	**5**
1B.	Write a short note on strong column –weak beam design with an illustration? Explain with a neat sketch the different types of steel braced frame.	**5**
2A.	Briefly explain the three chief tectonic sub regions in India. Explain the failure modes and earthquake resistant features for low strength masonry buildings.	**5**
2B.	What is Seismic zoning? Explain the design strategy as per 13920 -1993 for columns to resist earthquake forces?	**5**
3A.	Write a short note on Seismic Waves	**5**
3B.	Write a short note on i) Vibro-flotation ii) Re – entrant Corners	**5**
4A.	The free vibration decay curve of a system is shown in Fig.Q4A. If the stiffness of the spring is 250 N/m determine (i) Logarithmic decrement (ii) Damping ratio (iii) Damped frequency (iv) Undamped frequency (v) Mass (vi) Damping Coefficient (vii) Amplitude at 8 cycles.	**5**
4B.	Derive the differential equation of motion for the free vibration of an over damped SDOF system with the following initial boundary conditions i) at t = 0 $V(t) = V_o$ and $V(t) = V_o$ ii) at t = 0 $V(t) = V_o$ and $V(t) = 0$ and also draw response curve.	**5**
5A.	A frame shown in Fig. Q5A supports a rotating machine, which exerts a horizontal force at the girder level of $F(t) = 0.8 \sin 5.0\ t$ kN. Assuming 4% of critical damping determine steady-state amplitude of vibration. Take E = 200 kN/mm^2 and $I = 3x10^7$ mm^4.	**5**
5B.	An undamped SDOF system is subjected to an external harmonic force of $P_0 \sin \omega t$. Derive an expression of response for initial condition at at t = 0 $V(t) = V_o$ and $V(t) = 0$.	**5**

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6.	A eight storied R.C.C framed building with live load of 4.5 kN/m^2 on floors is to be constructed in Patna on medium soil. Work out seismic forces on the structure. All beams and columns may be assumed to be 250 mm × 600 mm and 600mm × 600 mm respectively. The roof and floor slabs may be assumed as 130 mm and 150 mm thick respectively. The walls are present on all the beams except the roof and the thickness of the wall is 250 mm. (Refer Fig. Q6)	**10**

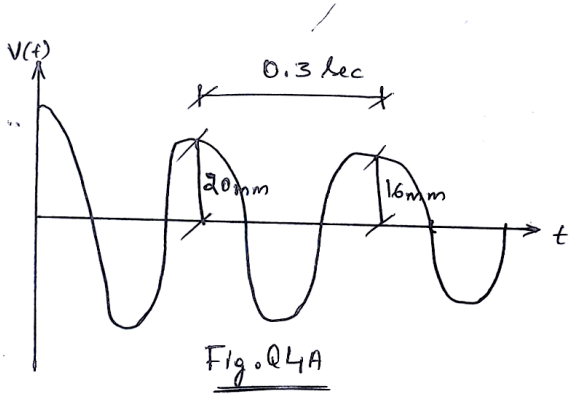


Fig. Q4A

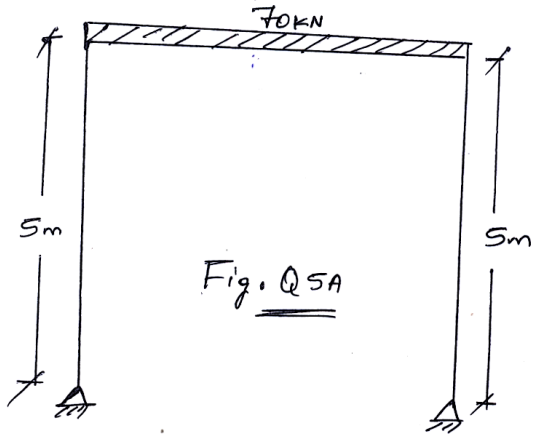
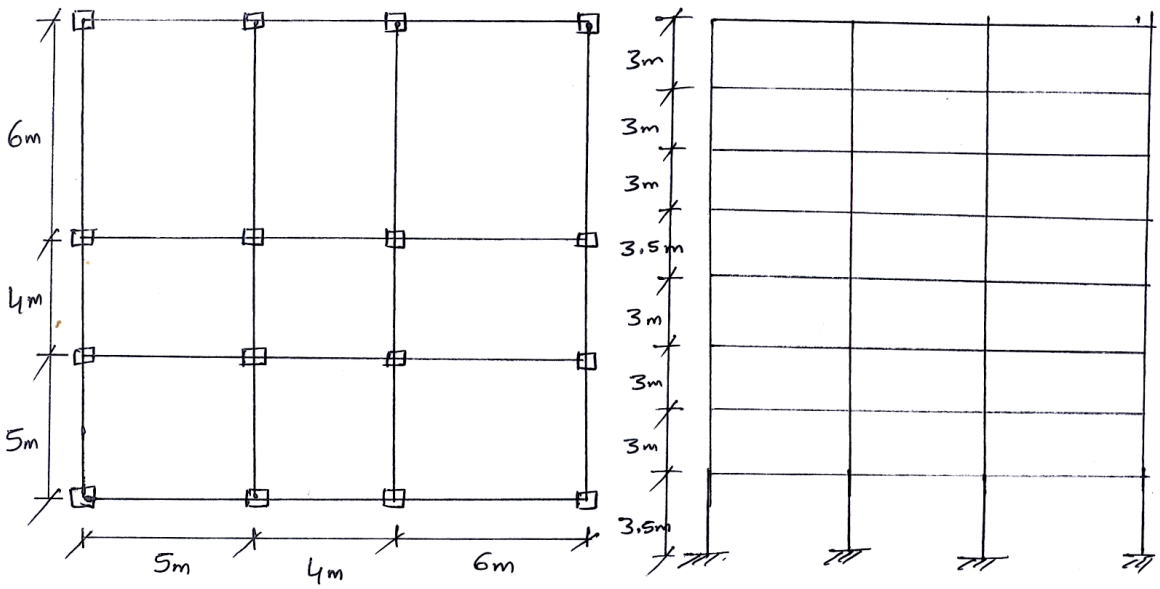


Fig. Q5A



PLAN ELEVATION

Fig. Q6

CIE 405 Page 2 of 2