SHANTILAL SHAH ENGINEERING COLLEGE, BHAVNAGAR

APPLIED MECHANICS DEPARTMENT

B.E. (Civil Engineering) Semester – 6th

Subject Code: 3160621	**Name of Subject: Earthquake Engineering**
Date: 19/03/2021	**Assignment No: 01**

Earthquake Basics

#	Questions
1	Differentiate between magnitude and intensity.
2	Give expression for (i) local magnitude (ii) Surface magnitude (iii) Moment magnitude.
3	Draw neat sketch of seismograph and enlist its components.
4	Define the terms: (i) epicentre (ii) Hypocentre (iii) Aftershocks (iv) Mesoseismal (v) Seismogram (vi) Accelerogram
5	Enlist various causes or earthquake.
6	List the seismic waves generated during earthquake. Which of these waves are dangerous for building structures?
7.	Explain "elastic rebound theory'.
8.	Describe "seismic waves' briefly.
9.	Give classification of earthquakes.
10.	Explain the method to locate epicentre of earthquake. Give important parameters
11.	Write short note: 'Richter magnitude scale'.
12.	Discuss various effects of earthquake.
13.	Differentiate between seismograph and seismogram.
14.	Explain interior of the earth with sketch
15.	Define tectonic plates. Discuss plate tectonic theory.
16.	Define fault? Explain various types of faults.
17.	Describe the inter-plate earthquake and intraplate earthquake?
18.	Specify different scales used to measure magnitude and intensity of earthquake

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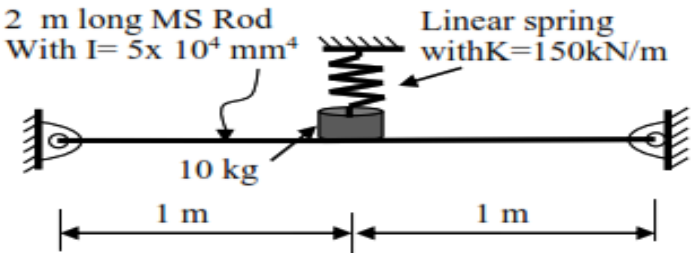
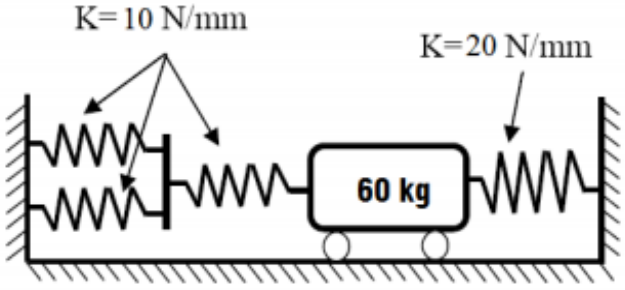
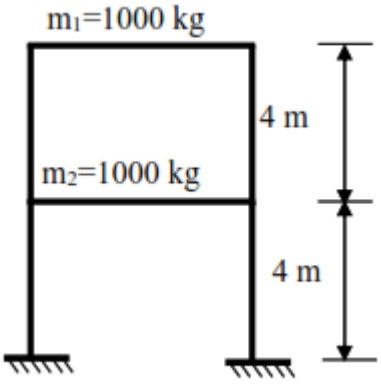
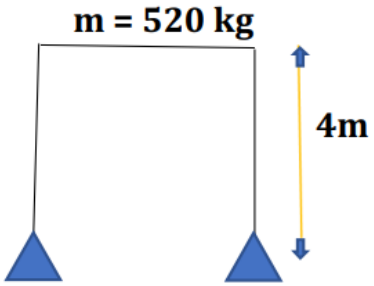
Subject Code: 3160621	**Name of Subject: Earthquake Engineering**
Date: 19/03/2021	**Assignment No: 02**

FUNDAMENTALS OF EARTHQUAKE VIBRATIONS OF BUILDINGS

(Part-I)

#	Questions
1	**Define:** (i) Vibration (ii) Oscillation (iii) Damping (iv) Resonance (v) Free Vibration
2	Explain spring in Series & in Parallel.
3	Describe the concept of mathematical modelling? Write the assumptions made in it.
4	Derive the equation of response of SDOF for free undamped vibration system.
5	Derive the equation of response of SDOF for free damped vibration system.
6	Explain the concept of logarithmic decrement.
7	Find out the natural frequency & time period of the system as shown in the fig below. 
8	Find out the natural frequency & time period of the system as shown in the fig below. 

9	A spring mass model consisting of 9 kg mass and a spring having stiffness 3.6 N/mm was tested for viscous damped vibration and the test record showed two successive amplitudes as 1.75 and 1.5. **Determine:** 1. Natural frequency of Undamped & Damped System 2. Logarithmic Decrement 3. Damping ratio 4. Damping Coefficient 5. Damped natural period.
10	An idealized SDOF system consists of a RCC water tank shaft of 4 m outer diameter & 120 mm wall thickness, which supports a container with lumped weight of 2800 kN at its top. The effective height of column shaft is 15 m. The damper offers the resistance of 25 kN at the velocity of 3 m/sec. Calculate the damping ratio and state whether the system is under damped, over damped or critically damped. Also calculate the damped frequency. Consider $E = 25000\ Nmm^2$
11	A SDOF vibrating system is having following parameters. m = 200 kg, k = 160 N/m, c = 40 N – sec / m. **Determine:** (i) The damping ratio (ii) The natural frequency of damped vibration (iii) Logarithmic decrement (iv) The ratio of two successive amplitudes (v) The number of cycles after which the original amplitude is reduced to 50%
12	A mass has a frequency of 10 Hz, when mass is decreased by 0.4 kg, the frequency is changed by 25%. **Determine:** i. The Mass (m) ii. The Spring Constant (k)
13	Find out the natural frequencies and draw the corresponding mode shapes for the given frame as shown in fig below. 

14	A three-story building frame with uniform floor height of 4m is having lumped masses of 8 tonnes, 6 tonnes and 4 tonnes at first, second and third floor respectively with uniform storey stiffness of 1000 kN/m at each floor. Calculate natural frequency and draw corresponding mode shapes. Also verify the orthogonal condition and normalization of modes.
15	A steel frame as shown in fig supports a rotating machine which exerts a horizontal force at gantry level of 51500 sin 11.5t N. Assume 5 % of Critical damping. What is the steady state displacement of vibration? Also state system will have resonance or not? Take $E = 21 \times 10^{10}\ N/m^2$ $I = 1500 \times 10^{-7}\ m^4$ 

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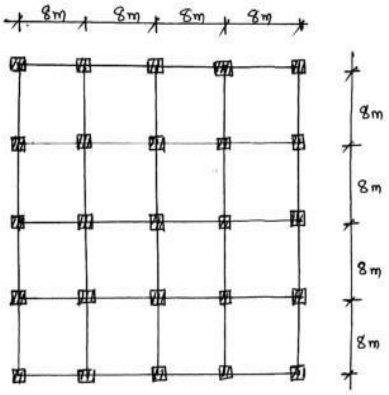
B.E. (Civil Engineering) Semester – 6th

Subject Code: 3160621	**Name of Subject: Earthquake Engineering**
Date: 01/04/2021	**Assignment No: 03**

Design Philosophy

#	Questions
1	Using static co-efficient method find the design lateral seismic forces and its Distribution along the height for a building having following details. (i) Location: Ahmadabad (ii) Configuration: 4 bays of 5 m each along x and y direction (iii) Height: ground + 4 storey each of 3.0 m floor height (iv) Columns: 300 x 300 mm all, Beams: 300 x 450 mm, Slab: 150 mm thick RCC (v) Walls: Outer 250 mm brick masonry, inner 150 mm brick masonry, Parapet: 230 mm thick 1 m high brick masonry (vi) Live Load=2 kN/m^2 Floor finish = 1 kN/m^2 roof finish=2 kN/m^2
2.	A four storied square RC framed building shown in Fig below with live load 4 kN/m^2 is to be constructed in Surat. Work out seismic forces on the structure by seismic coefficient method using IS 1893. All beams and columns size 300mm x 400 mm. Thickness of roof and floor slab 120 mm thick. Wall is of 150 mm thick all-around Height of each floor 3m. Density of concrete is 25 kN/m^3 

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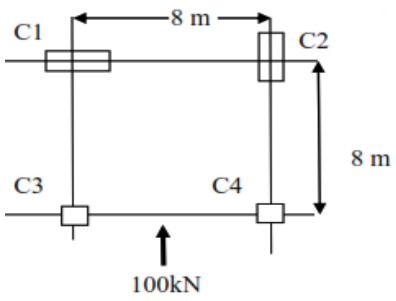
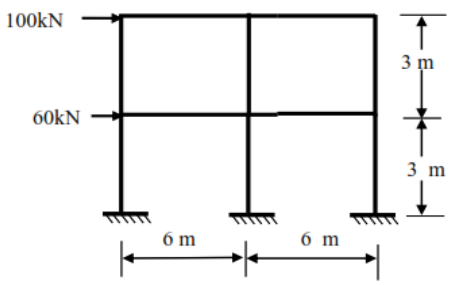
B.E. (Civil Engineering) Semester – 6th

Subject Code: 3160621	Name of Subject: Earthquake Engineering
Date: 15/04/2021	Assignment No: 04

Lateral Loads on buildings

#	Questions
1	Explain 'rigid diaphragm' and 'Flexible diaphragm'.
2	Distinguish between 'Centre of mass' and 'Centre or stiffness'.
3	Explain the procedure for design eccentricity calculation as per IS : 1893 (I) - 2002
4	Differentiate between torsionally coupled and torsionally uncoupled system
5	For a rigid floor as shown in fig below: (i) Locate centre mass, centre of stiffness and find design eccentricity. (ii) Find lateral loads on columns Columns C1 and C2 are of 3000 x 500 mm c/s C3 & C4 are 300x300 mm square. Mass is uniformly distributed. 
	Analyse the building frame shown in figure by portal method and Draw SFD, BMD and AFD 

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Subject Code: 3160621	**Name of Subject: Earthquake Engineering**
Date: 22/04/2021	**Assignment No: 05**

Ductile Detailing

#	Questions
1	Explain ductile detailing of column as per IS 13920 – 1993. Also give limitation of this code.
2	Do as directed: (i) Sketch the reinforcement details for c/s of RCC column 400 x 400 mm, having 8 nos. 20 mm dia main bars as ductile requirement (ii) Sketch the qualitative L/S of 6 m long RCC beam of special moment resisting frame having cross section 300 mm wide 600 mm deep.

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Subject Code: 3160621	**Name of Subject: Earthquake Engineering**
Date: 28/04/2021	**Assignment No: 06**

Special Topics

#	Questions
1	Enlist the different methods of structural control and explain any one in detail.
2	Discuss the causes and effects of liquefaction? Write the preventative measures of liquefaction.
3	Explain Beam & Column jacketing with neat sketch.
4	Explain Repair, Restoration, Rehabilitation & Retrofitting.
5	Discuss various energy dissipation devices.