Shantilal Shah Engineering College- Bhavnagar
Applied Mechanics Department
PDDC 5th Semester Civil Engineering
## Subject: Earthquake Engineering (X50602)
Assignment No. 1
<u>Earthquake Basics</u>

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) Aseismic (v) Mesoseismal (vi) Seismogram (vii) 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 of earthquake.

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. What is fault? Explain various types of faults.

17. What is inter-plate earthquake and intraplate earthquake?

18. Specify different scales used to measure magnitude and intensity of earthquake

Assignment No. 2
Fundamentals of Earthquake Vibrations of Buildings

1. Define: (i) Vibration (ii) Oscillation (iii) Damping (iv) Resonance (v) Free Vibration

2. Explain spring in Series & in Parallel.

3. What is Mathematical modeling? 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. Write a short note on logarithmic decrement.

7. Find the natural frequency of building frame shown in Fig below. Take EI = $3 \times 10^{13} Nmm^2$
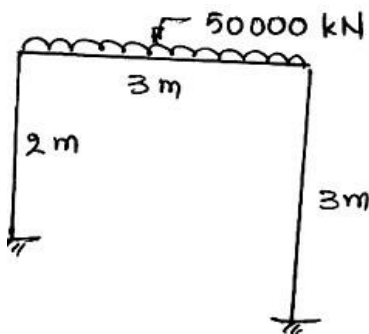
8. Find out the natural frequencies and draw the corresponding mode shapes for the given frame as shown in fig below.
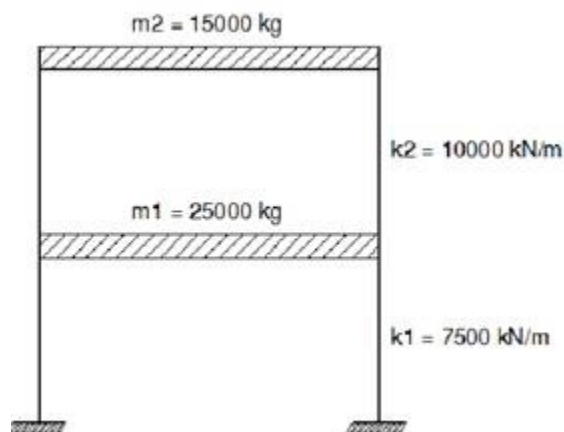
Earthquake Loads
on Buildings and
Lateral load
Analysis

1. For a RCC framed office building, find the design lateral forces and its distribution along the height, using static co-efficient method. Consider following data.

   Location : Gandhidham
   Soil condition : Medium soil
   Plan dimensions: 5 bays of 6 m each along X direction and 6 bays of 5 m each along
      Y direction
   Elevation : 6 storey including Ground storey , each with 3.5 m floor height
   Columns : 400 x 400 mm all
   Beams : 300 x 500 mm
   Slab : 150 mm thick RCC
   Walls : outer 230 mm brick masonry, inner 150 mm brick masonry
   Parapet walls: 230 mm thick 1 m ht.brick masonry.

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 25 kN/m^3
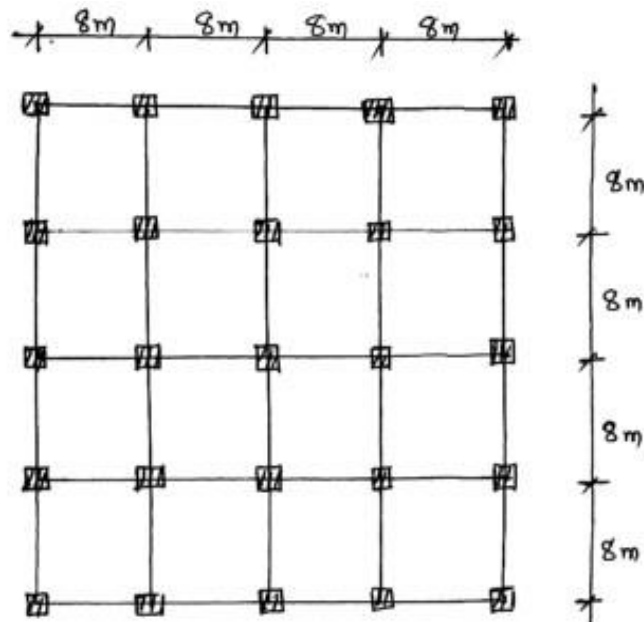
3. Explain 'rigid diaphragm' and 'Flexible diaphragm'.
4. Distinguish between 'Centre of mass' and 'Centre or stiffness'.
5. How design eccentricity is calculated as per IS : 1893 (I) - 2002 ?
6. What do you mean by torsionally coupled and torsionally uncoupled system?
7. Define the terms:
   - I. Diaphragm action
   - II. Rigid diaphragm
   - III. Flexible diaphragm
   - IV. Centre of mass
   - V. Centre of rigidity

8. A building having non-uniform mass distribution as shown in figure below. Locate its center of mass & stiffness.
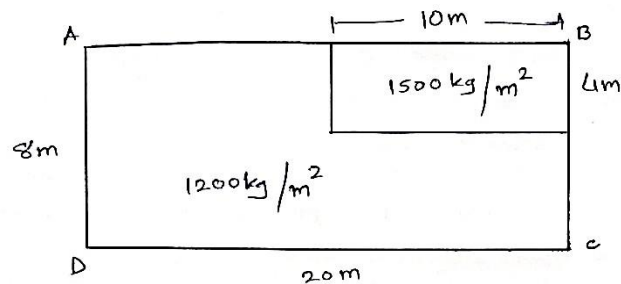

9. For a single storey building with Storey height 3 m shown in figure below located on hard soil. The following data is given. Z=0.24,I=1,R=5,tnz=0.1sec. Calculate the center of mass and center of stiffness. Find out the design eccentricities. Also find the earthquake force in column Al of the building due to direct lateral force in z-direction and torsion.
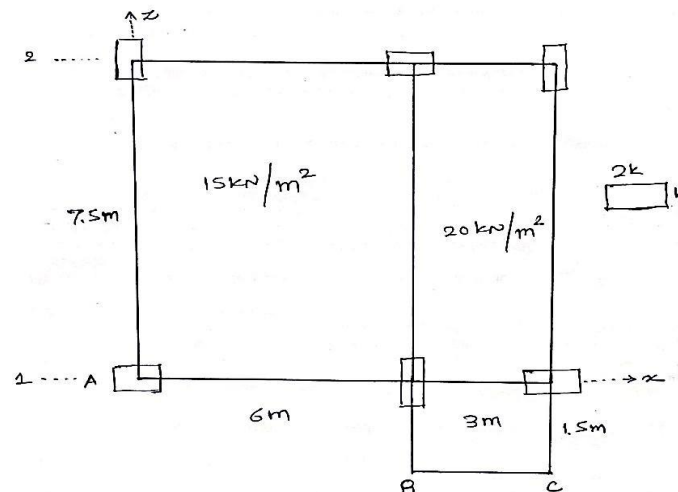
10. Analyze the building frame shown in figure by portal method and Draw SFD, BMD and AFD
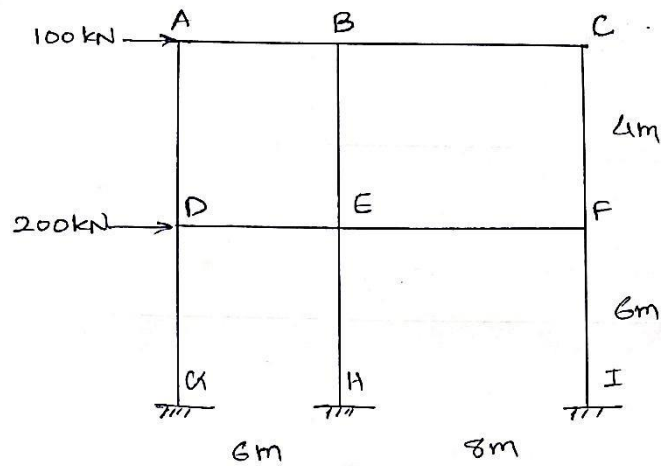
11. Analyze the building frame shown in figure by cantilever method and Draw SFD, BMD and AFD.
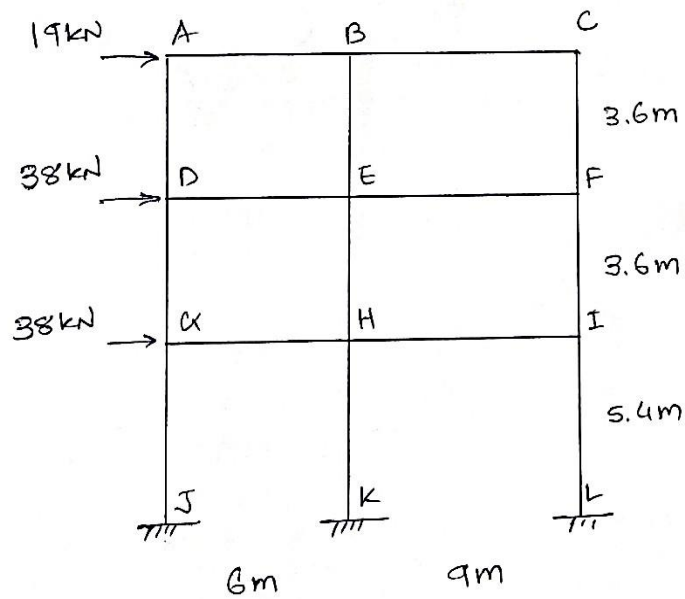
12. Explain ductile detailing of column as per IS 13920 – 1993. Also give limitation of this code.

13. 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.

Assignment No. 4
Special Topics

1. Enlist the different methods of structural control and explain any one in detail.
2. What are 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.