Tutorials/Practical for

Design of Reinforced Concrete Structures

(Program Elective II)

(3160612)

OR

Design of Reinforced Concrete Structures

(2960604)

B.E. Semester 6 (Civil)

P.D.D.C. Semester 6 (Civil)

Shantilal Shah
Engineering College

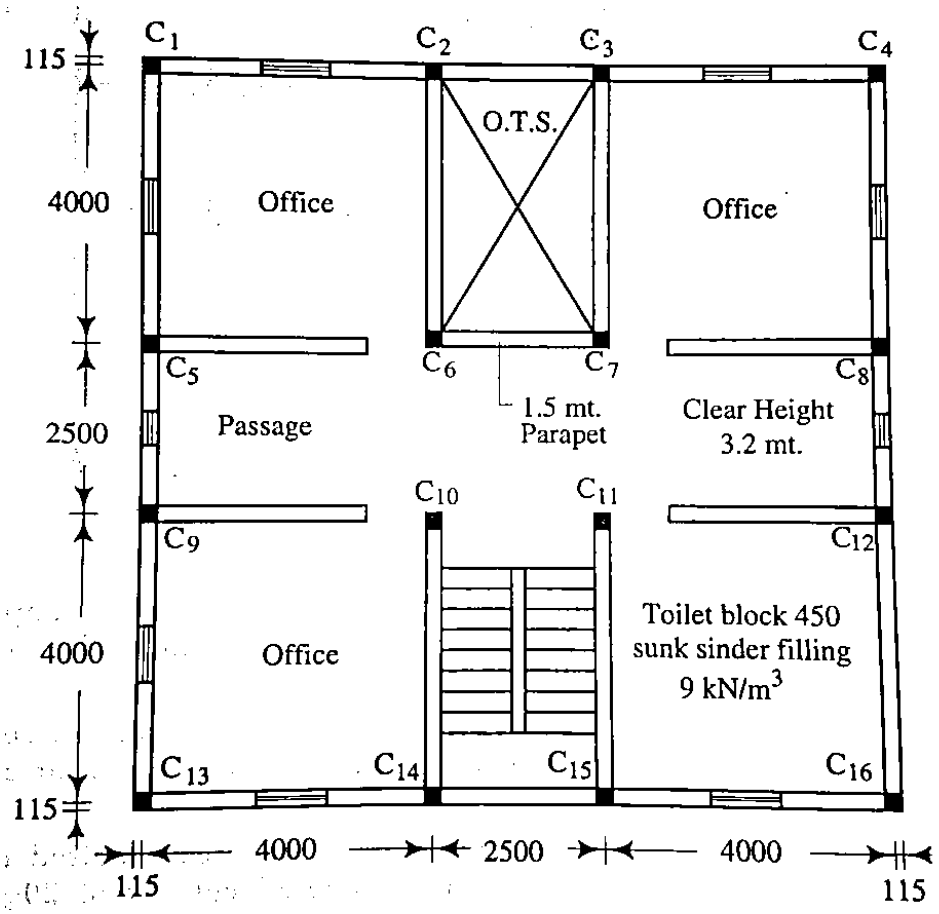
Directorate of Technical Education

Gandhinagar, Gujarat

APPLIED MECHANICS DEPARTMENT

Tutorial- I Building Layout and Design

	Answer the following	Mapped With
1	Explain the flow of loads in a Building. Also define a framed structure.	CO2
2	What are secondary and main beams? How will you calculate self weight of slab and beam?	CO1 & CO2
3	List down the guidelines for preparing the structural layout of the building taking into consideration the economy and aesthetic features. Also explain the guidelines for positioning and orientation of column in framed structure.	CO1 & CO2
4	Determine the wind forces for an elevated Intze water tank for the design life of 100 years. The data of tank are: Height of tank = 32 m which includes height of supporting staff = 23 m and height of bottom conical dome = 2.5 m Height of central cylindrical portion = 5 m and Rise of conical dome = 1.5 m Diameter of supporting staff = 5 m and cylindrical portion = 12 m Tank is located at Rajkot having terrain category II with class B type of structures. The ground at which water tank located having slope 1V:8H and hill height = 320 m. The water tank is located from crest 100m in windward direction.	CO1 & CO2
5	A multi-storeyed building of G + 8 is located at Vadodara. The plan dimensions of the building are 32 m x 36 m, having bay width of 4 m in each direction. The height of each floor is 3 m and the height of parapet wall is 1 m. The building is located in terrain category II, where it is located on hill having ground slope is 120. The height of hill is 1000 m and the building is located 250 m in windward direction from crest. The design life of building is 50 years. Draw wind pressure diagram. Also find the wind force at nodal points.	CO1 & CO2
6	Prepare structural layout of the typical floor plan given below. Design G+3 building manually and make detailing in A2 size drawing sheet covering all required details in structural drawing. Live load on terrace = 1.5 kN/m^2 and on floor = 4 kN/m^2. Assume floor height = 3.5 m and all floor slab thickness = 130 mm. Make detailing for all beams, columns, slabs and foundation with staircase. Students can use spreadsheet for the design purpose. Design the same building using any of the structural software. Minimum one continuous beam, slab, column and footing manual calculation should be verified with the software results.	CO1, CO2 & CO 5


C1
C2
C3
C4
115
4000
Office
O.T.S.
Office
C5
C6
C7
C8
2500
Passage
1.5 mt.
Parapet
Clear Height
3.2 mt.
C10
C11
C9
C12
4000
Office
Toilet block 450
sunk sinder filling
9 kN/m3
C13
C14
C15
C16
115
4000
2500
4000
115
115

Tutorial- II Design of Retaining Wall

	Answer the following	Mapped With
1	Define Retaining wall. Explain the purpose of the retaining wall.	CO3
2	Discuss briefly various types of retaining walls and situations where a particular type is used.	CO3
3	When is the counterfort retaining wall preferred as a structure? Also explain the structural behaviour of counterforts in a counterfort retaining wall.	CO3
4	State the stability checks in design of retaining wall.	CO1 & CO3
5	Design and detail in A2 size drawing sheet for a cantilever retaining wall to retain the earth 4.2 m high for the following data: Top surface is horizontal behind the wall. Unit weight of soil = 17 kN/m^3, Angle of internal friction = 30^0, safe bearing capacity = 150 kN/m^2, Coefficient of friction between base and soil = 0.55. Use M20 –Fe 415.	CO1, CO3 & CO5
6	Design a counterfort retaining wall has a height of retaining earth of 6.2 m. Top surface is horizontal behind the wall. Unit weight of soil = 16.2 kN/m^3, Angle of internal friction = 30^0, safe bearing capacity = 150 kN/m^2, Coefficient of friction between base and soil = 0.6. Use M20 –Fe 415.	CO1, CO3 & CO5

Tutorial- III Design of Water Tank

	Answer the following:	**Mapped With**
1	Design and draw the reinforcement details for an underground circular tank for the following data: Diameter of the tank is 5.0 m; Depth of water is 2.5 m. The wall and base slab are not monolithic with each other. Use M30 grade of concrete and Fe415 grade of steel for design of the tank.	CO1, CO3 & CO5
2	Design and draw the reinforcement details a circular tank with fixed base for capacity of 4 Lacs litres. The depth of water is to be 4m including free board of 0.25 m. Assume $\mu = 0$ and the tank is free at the top and rest on the ground. Use M30 – Fe415	CO1, CO3 & CO5
3	Design and draw the reinforcement details an overhead intze tank with a capacity of 7 Lacs Litres with Frame type of staging. Height of staging above ground level = 15 m	CO1, CO3 & CO5
4	Design and draw the reinforcement details for an underground rectangular water tank for the following data: Dimensions of the tank is 4m x 10m x 3m; The subsoil consists of sand having angle of repose of 30^0 and saturated unit weight of 17 kN/m^3. The water is likely to rise up to ground level.	CO1, CO3 & CO5

Tutorial – IV Design of Flat Slab

	Answer the following:	**Mapped With**
1	Explain direct design method for design of flat slab. State limitations of direct design method.	CO1 & CO3
2	Write short note on equivalent frame method.	CO1 & CO3
3	Design an interior panel of a flat slab of size 5 m × 5 m without providing drop and column head. Size of column is 400 mm × 400 mm and live load on the panel is 3.5 kN/m^2. Take floor finish load as 1.4 kN/m^2. Use M25 concrete and Fe 415 steel.	CO1, CO3 & CO5
4	Design an interior panel of a flat slab with panel size 6 m × 6 m supported by columns of size 500 mm × 500 mm. Provide suitable drop and column head. Take live load as 4.2 kN/m^2 and floor finish load as 1.5 kN/m^2. Use M25 concrete and Fe 415 steel.	CO1, CO3 & CO5

Tutorial – V Earthquake Resistant Design of Building

Answer the following: **Mapped With**

1 Explain Earthquake resistant design philosophy and Explain four virtues of Earthquake Resistant design — CO4

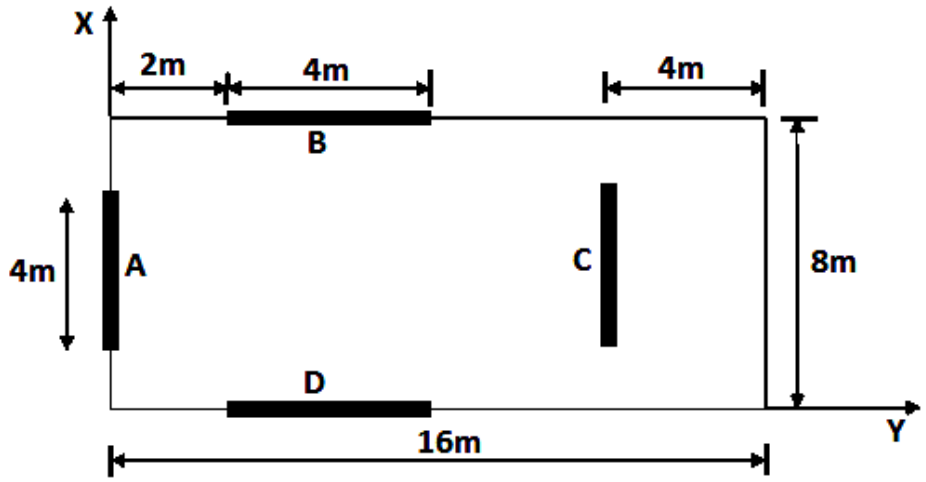
2 Explain the following provisions for ductile detailing as per IS:13920. — CO1 & CO 4

(i) Grade of concrete and type of steel
(ii) Diameter of stirrups.
(iii) Ductile detailing of beam
(iv) Ductile detailing of column
(v) Requirements of Shear wall

3 Draw and neatly detail reinforcement detailing (ductile) of three span reinforced concrete continuous beam of dimension 400 mm x 600 mm as per IS 13920. — CO1 & CO 4

4 A 4-storeyed RCC building having a plan area of 20 m x 20 m. The plan in X and Z direction comprises of 4 bays each of 5.0 m. The building is located in Bhuj. The soil condition is medium stiff and entire building is on raft foundation. RC frames are infilled with brick masonry. The lumped weight due to dead loads is 12 kN/m^2 on floors and 8kN/m2 on roof. The live load is 3.5 kN/m^2 on floors and 2.5 kN/m^2 on roof. Ground storey height is 4.5 m and other three stories are each of 3.0 m. Determine the Design Seismic force and shear at each level using Seismic Coefficient Method. — CO1 & CO 4

5 Determine lateral load distribution for a floor with shear walls as shown in Figure below. A earthquake lateral force of value "P" kN acts in Y-direction. — CO 4



References:

- Reinforced concrete, Vol I Part I & II, H. J. Shah, Charotar Publishing House Ltd. Anand, Year 2021
- Reinforced concrete, Vol II, H. J. Shah, Charotar Publishing House Ltd. Anand, Year 2021
- RCC Designs, B.C.Punamia; Laxmi Publication Pvt. Ltd., New Delhi, Year 2023
- Limit State Design of Reinforced Concrete Structures, B.C.Punamia, A. K. Jain and Arun Jain, Laxmi Publication Pvt. Ltd., New Delhi, Year 2023
- Earthquake resistant of design of structures, Pankaj Agrawal and Manish Shrikhande, PHI learning Pvt. Ltd., New Delhi, Year 2009.