DESIGN OF REINFORCED CONCRETE AND BRICK MASONRY STRUCTURES

UNIT I

RETAINING WALLS

2 MARKS

1. What is a Retaining wall?
2. What are the disadvantages of gravity retaining walls?
3. What are the types of retaining walls?
4. What is a cantilever retaining wall?
5. What is a counter fort retaining wall?
6. What are the forces acting on a retaining wall?
7. Define Active Earth pressure and passive earth pressure.
8. Give the criteria for the design of gravity retaining wall.
9. What are the stability conditions should be checked for the retaining walls
10. Give the minimum factor of safety for the stability of a retaining wall.
11. Draw the various Drainage provisions in Retaining wall
12. If a retaining wall of 5 m high is restrained from yielding, what will be the total earth pressure at rest per metre length of wall? Given: the back fill is cohesion less soil having $\phi = 30°$ and $\gamma = 18$ kN/m^3.
13. A cantilever retaining wall of 7 metre height retains sand. The properties of the sand are γ_d = 17.66KN/m3 and γ_{sat} = 29.92 KN/m3 $\phi = 30°$. using Rankine's theory determine active earth pressure at the base when the backfill is (i) Dry, (ii) Saturated and (iii) Submerged.
14. What do you meant by back fill of retaining wall? (Nov 2007) (Nov 2010)
15. List out the various forces subjected to a cantilever retaining wall. (Nov 2007)
16. What is the structural action of the stem, heel and toe of a cantilever retaining wall? Illustrative with a sketch. (Nov 2008)
17. Why counterforts are provided in a counter fort retaining wall? (Nov 2008)
18. Define stability of the retaining wall structures. (Nov 2009)
19. Brief how the vertical slab for the counter fort retaining wall is designed? (Nov 2009)
20. Explain the term surcharge. (Nov 2010)
21. Where will be the critical section for shear located in the design of heel slab of a cantilever retaining wall? (Nov 2010)
22. What are the modes of failure of a retaining wall? (Nov 2010)

16 MARK QUESTIONS

1. Design a reinforced concrete cantilever retaining wall to retain earth level with the top of the wall to a height of 5.5 m above ground level. The density of soil at site is 17 KN/Cu.mts with a safe bearing capacity of 120 KN/sq.mts. Assume the angle of shearing resistance of the soil as 35 degrees. Further assume a coefficient of friction between soil and concrete as 0.55. Adopt M20 grade concrete and Fe415 HYSD bars.

2. Design a counter fort type retaining wall to support an earth fill of 7.5m above ground level. The foundation depth may be taken as 1.5m below the ground level. The safe bearing capacity of soil at site is 150KN/m^2.Unit weight of soil may be taken as 16KN/m^3 and an angle of shearing resistance of 30 degrees. Assume the value of coefficient of friction as .55.Adopt M-20 grade concrete and Fe-415 HYSD bars. Sketch the details of reinforcements in the retaining wall.

3. Design a T shaped cantilever retaining wall for the following data. (Nov 2007)
   i. Height of wall above GL = 3.5m
   ii. Depth of foundation = 1.3m
   iii. Unit weight of earth fill = 18 kN/m^3

iv. Angle of internal friction = 25°

v. Co – efficient of friction between soil and concrete = 0.44

vi. SBC of soil = 140 kN/m^2

vii. Adopt m20 grade concrete and fe415 grade steel.

4. Explain the methods of designing a shear key in a retaining wall. (Nov 2007)

5. Design a reinforced concrete cantilever retaining wall to retain earth with an inclined fill (20 Degree) level with the top of the wall to a height of 4.5 m above ground level. The density of soil at site is 15 KN/Cu.mts with a safe bearing capacity of 120 KN/sq.mts. Assume the angle of shearing resistance of the soil as 30 degrees. Adopt M20 grade concrete and Fe415 HYSD bars. (Nov 2008)

6. Design a counter fort type retaining wall to support an earth fill of 6m above ground level. The foundation depth may be taken as 1m below the ground level. The safe bearing capacity of soil at site is 200 KN/m^2.Unit weight of soil may be taken as 16KN/m^3 and an angle of shearing resistance of 30 degrees. Assume the value of coefficient of friction as 0.6. Adopt M-20 grade concrete and Fe-415 HYSD bars. Also the thickness of stem , base slab and counter fort as 300mm throughout and spacing of counter fort as 3m centre to centre. Sketch the details of reinforcements in the retaining wall. (Nov 2008)

7. Design a reinforced concrete cantilever retaining wall to retain earth level with the top of the wall to a height of 3 m above ground level. The density of soil at site is 18 KN/Cu.mts with a safe bearing capacity of 100 KN/sq.mts. Assume the angle of shearing resistance of the soil as 30 degrees. Further assume a coefficient of friction between soil and concrete as 0.5. Adopt M20 grade concrete and Fe415 HYSD bars. (Nov 2009)

8. Design a counter fort retaining wall to retain earth level with the top of the wall to a height of 5 m above ground level. The density of soil at site is 16 KN/m^3 with a safe bearing capacity of 125KN/m^2. Assume the angle of shearing resistance of the soil as 30 degrees. Adopt M20 grade concrete and Fe415 HYSD bars. (Nov 2009)

9. Distinguish between active earth pressure and passive earth pressure. (Nov 2010)

10. Briefly describe the behavior of the various elements of a counter fort retaining wall. (Nov 2010)

11. Design a RCC cantilever retaining wall to retain earth level with the top of the wall to a height of 5 m above ground level. The density of soil at site is 18 KN/Cu.mts with a safe bearing capacity of 200 KN/m^2. Assume the angle of shearing resistance of the soil as 30 degrees. Further assume a coefficient of friction between soil and concrete as 0.5. Adopt M20 grade concrete and Fe415 HYSD bars. (Nov 2009)

UNIT II

WATER TANKS

2 Marks

1. What are the effects of the joint reactions due to continuity in water tank design? (Nov 2007)

2. Why the uplift pressure is critical on the floor of the underground tanks? (Nov 2007)

3. Why cover domes for a circular water tank is economical than flat cover slab? (Nov 2008)

4. Why bracings are provided in the staging of a water tank? (Nov 2008) (Nov 2009)

5. For what conditions the underground tanks are designed and checked? (Nov 2009)

6. What is the grade of concrete used in the construction of water tank? Give reasons. (Nov 2010)
7. Define the term meridional thrust. (Nov 2010)
8. What is the minimum requirement of steel to be used in domes? (Nov 2010)
9. Mention the three factors that must be considered while designing a RCC tank.
10. What are the types of reinforced concrete water tanks?
11. Mention the reinforcement details that should be provided in a water tanks.
12. Mention the thickness and steel requirement of dome.
13. What are the three types of joints in water tank?
14. Find out the diameter of a circular tank which is having a flexible base for capacity of 200000 liters. The depth of water is to be 4m, including a free board of 200mm
15. What is the foundation specification for small capacity tanks?
16. What are the methods available for the analysis of circular tank?

16 MARK QUESTIONS

1. Design an underground water tank 4m x 9m x 2.5m deep. The sub soil consist of sand having angle of repose of 30 degree and saturated unit weight of 18kN/m^3.The water table is likely to rise up to ground level. Use M_{20} concrete and HYSD bars. Take unit weight of water as 9.81kN/m^3. (Nov 2007)

2. Design the side wall of the circular tank of capacity 1.5 lakh liters of water. The depth of tank is limited to 2.5m. The joint between the wall and base as flexible. The base slab rest on the ground. Adopt M20 grade concrete and Fe415 HYSD bars. (Nov 2007)
3. Design a circular tank open at top and resting on a rigid soil has inner diameter 3m and height 3m.base joint between wall and base slab shall be assumed as hinged. Use M_{20} concrete and fe415grade steel. Design the wall. (Nov 2008)
4. A square elevated water tank 3m X 3m X 3m height is open at top. Base of the wall may be assumed as hinged. Use M25concrete and Fe 415 steel. Design the wall along the horizontal direction. (Nov 2008)
5. Design a circular tank with flexible base for capacity of 400 kilo liters. Use M_{20} concrete and Fe415grade steel. Design the wall. (Nov 2009)

6. Design an underground water tank 12m x 5m x 2.8m deep including a free board of 0.3m. The dry density of soil is 16kN/m^3 consist of dry soil having angle of repose of 30 degree. The outside soil which is 0.3m below the top of tank wall may be taken as fully saturated up to its full height. Design the side wall of tank. (Nov 2009)

7. Design a dome and ring beam of a circular tank of capacity 400,000 liters of water. The depth of storage is to be 5m. Assume that the joint between the wall and base as flexible. (Nov 2010)

8. Design the side walls of a rectangular RCC tank 6m X 2m X 2.5m deep. (Nov 2010)

UNIT III

SELECTED TOPICS

2 MARKS

1. Draw a neat sketch of flat slab with drop panel and column head? (Nov 2007)

2. When a mat foundation is resorted to a structure? (Nov 2008)

3. What are the advantages of box culvert over slab culvert? (Nov 2008)

4. List the different types of stairs. (Nov 2009)

5. Under what circumstances flat slab construction is preferred? (Nov 2009)

6. Explain the term going. (Nov 2010)

7. What is the function of drop panel. (Nov 2010)

8. Define prestressing. (Nov 2010)

9. Define flat slab.

10. What are all the components of flat slab?

11. Write the different types of flat slabs?

16 MARK QUESTIONS

1. Design a dog-legged stair for a building in which the vertical distance between floors is 3.6m.The stair hall measures 2.4m x 5m.The live load may be taken as 3000N/m^2.Use M_{20} concrete and Fe415 grade steel. (Nov 2007) (Nov 2009) (Nov 2010)

2. Design the interior panel of a flat slab 5.5m x 5.5m in size, for a super imposed load of 5000N/m^2. Use M_{20} concrete and Fe 415 steel. (Nov 2007)

3. Design an interior panel of a flat slab in a hotel carrying a superimposed live load of 3kN/m^2. Weight of floor finishes on the slab may be taken as 1kN/m^2. Choose a suitable thickness for slab and drop. The panel is supported on400 mm diameter circular column. Drops may be provided. The size of panel is 4m X 4m. Use M_{20} concrete and Fe415 steel. (Nov 2008)

4. An intermediate flight of a staircase is supported only at the edges of landing (support – perpendicular to the direction of the flight).height between landing is 1.5m. The flight has steps consisting of 10 risers (each rise =150mm) and a treads (each tread = 250mm). The steps are supported on a waist slab. Landing is 1m width. Support width is 300mm each. Design the waist slab and landing for bending moment alone. Use M_{20} concrete and Fe415 steel. (Nov 2008)

5. Design an interior panel of a flat slab in a hotel carrying a superimposed live load of 3kN/m2. Weight of floor finishes on the slab may be taken as 2kN/m2. The panel is supported on 300 mm diameter circular column. Drops may be provided. The size of panel is 5m X 7m. Use M_{20} concrete and Fe415 steel. (Nov 2009)

6. With examples, explain the structural behavior of stair slabs spanning transversely. (Nov 2010)

7. Design an interior panel of flat slab 6m X 6m for a live load of 5kN/m^2(Nov 2010)

8. Explain in brief the principles of pre tensioning and post tensioning systems with neat sketches. (Nov 2010)

UNIT IV
YIELD LINES
2 Marks

1. What are the characteristic features of yield lines? (Nov 2007)

2. Write the equation for calculating the ultimate moment in an orthotrophically reinforced rectangular slab. (Nov 2007)

3. Why yield line theory for slab always yield upper bound solution? (Nov 2008)

4. Sketch a yield line pattern for a circular slab continuous over its edge supports. (Nov 2008)

5. What are the methods of yield line analysis? (Nov 2009)

6. Sketch a yield line pattern for a rectangular slab fixed on all four sides. (Nov 2009)

7. Define yield line. (Nov 2010)

8. Sketch a yield line pattern for a triangular slab with one edge fixed and others are simply supported and for a rectangular slab with all edge continuous. (Nov 2010)

9. State the upper bound theorem. (Nov 2010)

10. Give the expression for the ultimate moment of resistance for an equilateral triangular slab with simply supported edges. (Nov 2010)

10. Draw a neat sketch of flat slab with drop panel and column head. (Nov 2007)

16 MARK QUESTIONS

1. A square interior panel of an intermediate floor is of effective dimension 5m X 5m.the live load on the floor is 2.5 kN/m^2. Finishes is 1 kn/m^2.analysis the slab using yield line approach and design the slab. Use M_{20} concrete and Fe 415 steel. (Nov 2008)

2. Derive the principles the ultimate design moments for a rectangular simply supported slab panel using yield line approach. Hence the determine the design moments for a simply supported rectangular slab 3m X 4m effective, subjected to a live load of $2.5kN/m^2$ and finishes of $1kN/m^2$.Assume suitable load factor. (Nov 2008)

3. A rectangular slab 4m X 5m is simply supported at the ends. Design the slab to carry a live load of 5 kN/m^2, if the slab is to be isotrophically reinforced. Use M_{20} concrete and Fe 415 steel. (Nov 2009)

4. A square slab of side length 4m is simply supported at the ends and carries a service load of $3kN/m^2$.Design the slab .Use M_{20} concrete and Fe 415 steel. (Nov 2009)

5. Enumerate the characteristics features of the yield line.

6. Derive the expression for calculating the ultimate moment of a simply supported circular slab. (Nov 2010)

7. A rectangular slab 3.5m X 5m is simply supported at the ends with 8mm diameter spaced at 150mm bothways. The total depth of the slab is 100mm with an effective cover of 20mm. assume floor finishes as 1.5kN/m2.determine the service load. (Nov 2010)

UNIT V

Brick Masonry

2 MARK QUESTIONS

1. What is cross sectional area of Masonry unit?

Net cross sectional area of a masonry unit shall be taken as the gross cross sectional area minus the area of cellular space. Gross cross sectional area of cored units shall be determined to the outside of the coring but cross sectional area of groves shall not be deducted from the gross cross sectional area to obtain the net cross sectional area.

2. What is bond in brick masonry?

Arrangements of masonry units in successive courses to tie the masonry together both longitudinally and transversely; the arrangement is usually worked out to ensure that no vertical joint of one course is exactly over the one in the next course above or below it, and there is maximum possible amount of lap.

3.How will you calculating effective length, effective height and effective thickness?

The height of a wall to be column to be considered slenderness ratio. The length of a wall to be column to be considered slenderness ratio. The thickness of a wall or column to be considered for calculating slenderness ratio.

4.What meant by lateral support?

A support which enables a masonry element to resist lateral and/or restrains lateral deflection of a masonry element at the point of support

5. What is the minimum thickness of basement walls?

S.No	Minimum thickness of basement wall (nominal) cm	Height of the ground above basement floor level with wall loading (permanent load)	
		More than 50kN/m (m)	More than 50kN/m (m)
1	40	2.50	2.00
2	30	1.75	1.40

6. What is the slenderness ratio for walls and columns?

For a wall, Slenderness ration shall be effective height divided by effective thickness or effective length divided by the effective thickness is less.

For column slenderness ration shall be taken to be the greater of the ratios of effective heights to the respective effective thickness in the two principal directions. Slenderness ratio for a load-bearing column shall not exceed 12

7. What is effective length of a masonry wall with respect to its support condition?

Effective length of a masonry wall varies depending on its support conditions as below

S.No	Conditions of support	Effective Length
1	Where a wall is continuous and is supported by cross wall, and there is no opening within a distance of H/8 fro the face of cross wall	0.8L
2	Where a wall is supported by a cross wall at one end and continuous with cross wall at other end	0.9L
3	Where a wall is supported at each end by cross wall	1.0L
4	Where a wall is free at one and continuous with a cross wall at the other end	1.5L
5	Where a wall is free at one end and supported at the other end by a cross wall	2.0L

7. What is effective height of a masonry wall with respect to its support condition?

S.No	Conditions of support	Effective Height
1	Lateral as well as rotational restraint at top and bottom	0.75 H
2	Lateral as well as rotational restraint at one end and only restrained at the other	0.85 H
3.	Lateral restraint without rotational restraint on both ends	1.00 H
4	Lateral as well as rotational restraint at bottom but have no restraints at top	1.50 H

8. What is slenderness ratio in brick masonry structures?

In brick masonry structures

For a wall slenderness ratio shall be the effective height divided by the effective thickness or effective length divided by the effective thickness which ever is less.

For a column slenderness ratio shall be taken to be the greater of the ratios of effective height s to the respective effective thickness in the two principal directions. Slenderness ratio of a load-bearing column shall not exceed 12.

PART – B

16 MARK QUESTIONS

1. Explain the factors to be considered while designing brick masonry with respect to stability and lateral supports on the structure.
2. What are the factors to be considered while determining the effective height of wall and columns and effective length of walls?
3. Explain the design procedure to design axially and eccentrically loaded brick walls

4. Design a solid wall of a single storey mill building that is 300mm in height, securely tied with roof and floor units and supporting two beams on either side of it. The exert reaction of 30kN and 20kN. The thickness of wall is 230mm, the beam bears on the wall is 115mm. Assume uniform bearing stress. Neglect the load due self weight. (DEC 2007)
5. Design a solid square masonry column of height 2000mm, to carry an axial load of 150 kN. The column is tied at the top and bottom. Include the self weight of the column for the design. (DEC 2007)