31051- Structural Engineering

UNIT 1

PART – A (2 MARK)

1. Define modular ratio.
2. Define grade of concrete.
3. What is neutral axis?
4. Define design load in limit state method.
5. What is meant by balanced section?
6. Define load factor method?
7. What is lever arm?
8. What is meant by effective span?
9. Define characteristic load.
10. How to calculate breadth and depth?

PART – B (3 MARK)

1. What is purpose of providing reinforcement?
2. List out the Advantage of limit state method.
3. What is the difference between singly and doubly reinforcement?
4. Write notes on partial safety factor?
5. Write notes on types of load in RC structure?
6. Write the procedure for simply supported and cantilever beam?
7. What is the difference between characteristic load and design load?
8. What are the different types of limit state method?

PART – C (10 MARK)

1. A simply supported rectangular beam of span 4m span carries an udl 20kN/m excluding self weight. The beam section is 230x450mm overall. Design the beam using M20 grade concrete and Fe 415 steel
2. A beam 230mm wide and 400mm effective depth is reinforced with 3 nos of 16mm dia mild steel bar in tension. Compute the factored moment using M20 mix.
3. A simply supported rectangular beam of effective span 6.3m carrying a udl of 13.5 KN/m throughout its length. Design the mid span section for the limit state of collapse in flexure using M15 concrete and Fe 415 steel. Assume the breadth of support as 300mm
4. A rectangular section of overall size 300mmx600mm is reinforced with 4 bars of 20mm dia in the tension zone and 2 bars of 20mm dia in compression zone with a clear cover of 25mm, M20 and fe415 used. Find the limiting moment of resistance of the section
5. A simply supported rectangular beam has to be provided over a clear span of 12m to carry an udl of 20kN/m excluding its self weight. Design a mid span section of the beam using M20 grade steel in tension for the limit state collapse in flexure. Assume width of support as 300mm.

6. A rectangular section of breadth 250mm and overall depth 650mm has an effective cover for tension reinforcement is 50mm. Assuming the section as balanced one grade of concrete M25 and grade of steel fe415. Calculate the moment of resistance in limit state method.
7. A beam 230mm wide and 400mm effective depth is reinforced with 3 Nos of 16mm dia MS bars in tension. Compute the factored moment using M20 mix.
8. Explain how the design stress for compression steel of a beam can be determined for the stress – strain curve.
9. A rectangular RC beam of M20 grade concrete is 250mm wide and 500mm deep to the centre of steel. It is reinforced with 3 numbers of 20mm dia. Mild steel bars in the tension zone only. Calculate the moment of resistance of the section at the limit state collapse.
10. A cantilever beam of rectangular section250mm wide and 500mm overall depth has to carry an udl of 24kN/m (inclusive self weight) over an effective span of 3.4m. M20 grade of concrete and fe415 grade steel used. Design the reinforcement for flexure by LSM.

UNIT 2

PART – A (2 MARKS)

1. What is T beam?
2. What is L beam?
3. What is meant by nominal shear stress?
4. Where and why lintel is provided?
5. Draw the cross section of cantilever T beam?
6. What is the minimum depth required for stiffness?
7. When a beam is called continuous beam?
8. What is the code provision for minimum shear reinforcement?

PART – B (3 MARKS)

1. What are the critical section for shear in beam?
2. Write the design procedure for continuous beam?
3. What are the different forms of shear reinforcement?
4. Write about neutral axis and all condition?
5. What is continuous beam and explain how the effective span is determined?
6. Write the design procedure for simply supported beam?

PART – C (10 MARK)

1. Design the shear reinforcement for a RC rectangular beam size 250mmmx500mm effective M15 concrete and Fe 415 are used. Percentage of steel is 0.85% and factored shear force is 180kN.
2. A continuous rectangular beam with 7m equal spans (effective) carries an imposed load (not fixed) of 12 KN/m throughout its length. Design the interior panel for the beam using M20 grade concrete and Fe 415 steel.
3. Find the moment of resistance of a "T" beam with the following data: Effective flange width 740mm, thickness of slab 80mm, breadth of rib 240mm, Effective depth 400mm , concrete and steel grade ; M20 and Fe 250; Reinforcement 5 nos of 25mm dia bars.
4. The support section of a doubly reinforced beam is subjected to a shear force 80 KN, the beam is 245mm x 550mm effective size. It is reinforced with 3 nos of 20mm dia deformed bars in the tension zone. Design the shear reinforcement for the support section using 8mm dia mild steel bars., M20 grade concrete is used.
5. Design the shear reinforcement for a RC rectangular beam size 250mmmx500mm effective M15 concrete and Fe 415 are used. Percentage of steel is 0.85% and factored shear force is 180kN.
6. A T beam of reinforced concrete has a flange width of 1400mm and depth of flange 120mm, reinforced with 942mm^2 of tension steel of grade fe415, if the effective depth of the beam is 450mm and width of web 230mm. find the working load of udl by first finding its moment of resistance, the grade of concrete is M25. Assume the beam is simply supported over an effective span of 6m.

7. A continuous rectangular beam with 7m equal spans effective carries an imposed load of 12kN/m and a dead load 24ekN/m throughout its length. Design the beam for the maximum bending moment using M25 grade concrete and FE415 grade steel.
8. A continuous beam with 7m equal span (effective) carries an imposed load (not fixed) off 12kN/m through out its length . Design the shear reinforcement for the beam using M20 grade concrete and fe415 grade steel

UNIT 3

PART – A (2 MARKS)

1. Define one way slab?
2. Define flat slab?
3. What is two way slab?
4. What is staircase?
5. What is meant by curtailment of bars in slab?
6. Where will be provided torsion reinforcement?
7. Define anchoring of reinforcement.
8. List out the components of staircase?

PART – B (3 MARKS)

1. Write a short note on one way and two way slab?
2. What is meant by flight applicable to stair?
3. List the types of one way and two way slab.
4. Write short notes on function of distributors.
5. Write short notes simply supported slab and restrained slab?
6. Write short notes on middle strip and edge strip details in two way slab?

PART – C (10 MARKS)

1. Design a R.C.C slab simply supported on masonry walls 3.8m apart with M20 grade concrete and Fe 415 steel. Imposed load (not fixed $2kN/m^2$), floor finish $0.6kN/m^2$ and bearing on each end 200mm.
2. Design a Simply supported roof slab for a room of clear dimension 2mx6m with wall thickness 200mm using M20 concrete and fe415 steel Weight of weathering course is $1.5kN/m^2$. Access provided to the roof.
3. Design a RC slab simply supported on masonry walls 4m apart with M25 mix and fe500 steel by limit state method imposed load (not fixed) is $5kN/m^2$ and floor finish load is $1.2kN/m^2$, bearing on each end is 250mm.
4. Design a two way slab to be supported by brick walls of 200mm width on all four sides the clear dimensions of the room is 2mx3m. Assume the total design load including self weight of the slab $5.74kN/m^2$, grade of concrete and steel and M15 and fe250.
5. List the different types of stairs used in ordinary buildings. Draw a neat sketch
6. The vertical height between two successive floors of a multi storied residential building is 3.2m. the clear size of the staircase room is 2.10m x 4.25m. plan a dog legged staircase for the building.
7. Design a simply supported roof slab for a library of clear size 4m x 5m by LSM. The thickness of walls all round is 250mm. Access is not provided to the roof. The corners of the slab are not held down. Weight of weathering course will be $1KN/m^2$. Use M20 grade concrete and Fe415 steel. (check for stiffness not necessary)

UNIT 4
PART – A (2 MARKS)

1. Define column?
2. Define supported length?
3. Define long and short column?
4. What is slenderness ratio?
5. What is meant by developed length?
6. What is axially loaded column?
7. Explain foundation?
8. What is meant by isolated footing?
9. What is punching shear?
10. Write the types of footing?

PART – B (3 MARKS)

1. Draw the neat sketch of rectangular footing?
2. Write the design procedure for footing?
3. Write short notes on short and long column?
4. Mention the various classification of column and explain?
5. Explain basic requirements of column footing.
6. Why lateral ties are provided in column?

PART – C (10 MARKS)

1. A RC column 250mmx250mm size has 4 Nos. of MS bars of 16mm dia one at each corner. The effective length of the column is 2.75m and M20 grade of concrete. Determine the strength of the column at limit state of collapse.
2. Design a square footing to withstand a total load of 1500kN including its self weight. The size of the column is 400x400mm (with 16mm dia bars). Assume Fe415 and M20 and safe bearing capacity of soil is 200kN/m^2. Design for depth and reinforcement only, not for anchorage and development length.
3. Design a circular RC column with lateral ties to carry an axial load of 1250KN. Take fck as 20MPa and fy as 500MPa. The unsupported length of column is 4m. the ends of columns are effectively held in position but not restrained against rotation.
4. The size of the rectangular footing provided for an RC column of 300mm x 500mm size is 3m x 3.6m. the column carries an axial load of 1500KN. The thickness of footing is 1m along the faces of column and 200mm along its free edges. 18 nos of 12mm dia Fe415 steel bars are provided in each direction at an Fe415 steel bars are provided in each direction at an average effective cover of 70mm. check the footing for transverse shear. The concrete used is M20 grade.
5. Design a RC squre column with lateral ties to carry an axial load of 1250KN. Take fck as 20MPa and fy as 500MPa. The unsupported length of column is 4m.

UNIT 5

PART – A (2 MARKS)

1. What is meant by tension member?
2. What is meant by ISJC and ISWB?
3. Draw any 2 types of compression member.
4. What do you understand by lateral supported beam?
5. What is section modulus of steel beam?
6. What are the requirements of weld?
7. Define net sectional area of tension member.
8. What is shape factor?

PART – B (3 MARKS)

1. Explain types of welding?
2. Explain design procedure for simple beam?
3. Write the classification of beam.
4. List the advantage of welded connection?
5. Write the design procedure for compression member?
6. Explain ISHD, ISLT, ISJB, ISMB.

PART – C (10 MARKS)

1. Three holes of 20mm dia are available in single row in a steel plate of 200mm width and 12mm thickness and allowing edge distance and clear distance between the hole are to be 35mm each. Determine the design tensile strength of a plate if f_u=415N/mm^2 for the material.
2. Design a laterally restrained simple beam has to carry a maximum BM of 170kNm. The yield strength 0f steel is 300N/mm^2
3. Design a toe member using a single channel section to carry an axial load of 850KN , Fy 450MPa, Fu 570MPa. The member will be connected at its ends through its web by side fillet welds of 300mm length each.
4. A laterally supported cantilever beam of 3m effective span carries a load of 12.5KN/m including its self weight throughout its span. Design the beam by limit state method using double channels of yield stress 350MPa (check for stiffness not necessary)
5. A single angle ISA 100x65x10mm is to be connected at its ends to 8mm thick gusset plate by fillet weld through short leg along three side used as tension member. Design strength of angle . Take fy=300N/mm2 and fu=440N/mm2 for steel. The length of weld is 115mm.