STRUCTURAL DESIGN –II

QUESTION BANK

CHAPTER-I & II

2 MARKS

1. Mention the advantages and disadvantages of steel structures?
2. What is meant by Girder?
3. What is meant by joists?
4. What is meant by Purlins?
5. What is meant by Rafters?
6. What is meant by Lintel?
7. What is Girts?
8. What is meant by Spandrel beam?
9. Name the different types of connections?
10. Name the types of riveted connections?
11. What is meant by rivet value?
12. What is meant by gauge distance?
13. Name the different modes of failure of a riveted joint?
14. As per the American practice where the neutral axis lie in the rivet group?
15. What are the factors that govern will govern the structural design?
16. What are the load combinations for the design purposes?
17. What are the steps involved in structural design?
18. Which type of steel is most commonly used in general construction? Why?
19. What are Black bots? Where are they used?
20. How the rolled steel beams are classified?
21. Define permissible stresses and Working stresses.
22. Explain ISLB 200?
23. Name the types of beam connections?
24. What is meant by framed connections?
25. When the seated beam connections are preferred and name the types?
26. What is unstiffened seat connection?
27. What is stiffened seat connection?
28. What is meant by throat thickness?
29. What is plug weld and slot weld?
30. Mention the advantages and disadvantages of welded connections?
32. Name the types of bolted connections?
33. Write the advantages of high strength bolts?
34. Write down the interaction equation?
35. How will you calculate the number of rivets?
36. Define nominal diameter of rivet

37. Define gross diameter of rivet
38. What is meant by gauge distance and edge distance?
39. Define staggered pitch
40. What is meant by tensile stress?
41. What is meant by compressive stress?
42. Define bearing stress
43. What is working stress?
44. What are the methods employed for the design of the steel framework?
45. What are the assumptions made in simple design
46. Define Poisson's Ratio.
47. What are the types of riveted joints?
48. What are the types of failures occur in riveted joint?
49. What are the assumptions made for designing riveted joint?
50. Write about minimum pitch and maximum pitch
51.What is edge distance?

CHAPTER -III

2 MARKS

1. Explain Tie member.
2. How the tension members are classified?
3. What is meant by single section member?
4. Under what circumstances you would go for Built-up members?
5. How the tension members are selected? It depends upon the various factors such as
6. Sketch the different forms a single section member
7. Sketch the different forms Built-up members.
8. How is net effective area of single angle used as tension member calculated?
9. What is net sectional area of a tension member? How it is calculated in chain riveting?
10. What is Lug angle?
11. What are the main objectives of the lug angles?
12. What is meant by Tension splice?
13. What is the net effective area of a pair of angles placed back to back connected by
One leg of each angle subjected to tension?
14. What is the permissible stress in axial tension?
15. How will you join the member of different thickness in a tension member?
16. What happens when a single angle with one leg is connected to a gusset plate?
Which is subjected to an eccentric load?
17. What is the allowable stress in axial tension for channel section?

18. What are tacking rivets? Why are they essential in compression members?
19. Write down the Steinman's formula
20. What will be the maximum pitch when the angles are placed back to back?
The maximum pitch when the angles are placed back to back is 1mm.

CHAPTER-III

1. What do you mean by compression members?
2. Name the modes of failures in a column.
3. Define slenderness ratio
4. Classify the columns according to the slenderness ratios.
5. Distinguish column and strut
6. What is meant by stanchions?
7. What is Post?
8. What is a boom?
9. State the assumptions that made in Euler's theory.
10. Why the lateral systems are provided in compound columns?
11. Name the lateral systems that are used in compound columns and which is the
Mostly used one?
12. What will be the thickness for the single and double lacing bars?
13. What is the purpose of providing battens in compound steel columns?
14. What is the thickness of a batten plate?
15. Where the perforated cover plates are used and mention its advantages?
16. Name the types of column base?
17. State the purpose of column base?
18. Give the difference between slab base and gusseted base for steel columns.
19. What is slab base and for what purpose is it provided?
20. When the slenderness ratio of compression member increases, the permissible Stress decreases. Why?

CHAPTER-IV

1. What is a Beam?
2. What is meant by castellated beam?
3. How the beams are failed?
Bending failure
4. What do you mean by bending failure?
5. What is the maximum deflection that to be allowed in steel beams?
6. What is web crippling?

7. What are laterally supported beams?
8. Mention the advantages of using rolled steel wide flange section as beams
9. Why does buckling of web occur in beams?
10. What are the permissible stresses used in the beams?
11. Under what situations the plated beams are used?
12. Why intermediate stiffeners are required for plate girders?
13. What do you mean by curtailment of flanges?
14. What is the purpose of providing the bearing stiffener?
15. Name the components of a plate girder.
16. Mention the basic design assumptions of a plate girder?
17. Where the plate girders are used?
18. What are the methods that are adopted to determine the flange design?
19. What is the economical depth of a plate girder?
20. The pitch of the rivets connecting cover plates with flanges of rolled steel beam is
21. Designed for what force?

CHAPTER-V

1. Name the types of roofing systems.
2. Where the steel roof trusses are used?
3. Mention the advantages of a roof truss.
4. What is the factor that is considered in the roof truss and why?
5. How the trusses are classified according to the pitch?
6. Sketch the various types of roof truss.
7. Name the components of a roof truss.
9. What is meant by purlins?
10. Why the bracings are provided?
11. Name the most common roof covering materials.
12. Write the equation to calculate the design wind pressure.
13. Mention some of the requirements of a good joint.
14. What are the conditions that to be satisfied for the end supports?
15. Where the gantry girders are used?
16. Sketch the various forms of gantry girders.
17. What is drag force?
18. What is the permissible deflection where the electrically overhead cranes Operated over500kN?
19. Define shoe angle.
20. What is panel point?

21. What is the permissible deflection where the electrically overhead cranes Operated over 500kN?

5&7 MARKS

CHAPTER-I &II

1. Write about the advantages of welding. List the various types of welded joints
2. Write about the disadvantages of welding.
3. What is the effective area of butt weld? How the length of bolt is calculated?
4. A double riveted double cover butt joint is used to connect plates 12 mm thick. Using Unwin's formula, determine the diameter of rivet; rivet value, gauge and efficiency of joint. Adopt the following stresses: Working stress in shear in power driven rivets = 100 N / mm2 (Mpa) Working stress in bearing in power driven rivets = 300 N / mm2 (Mpa) Working stress in axial tension in plates = 0.6 fy
5. Determine the strength of a double cover butt cover butt joint used to connect two flats 200 F 12. The thickness of each cover plate is 8 mm. flats have been joined by 9 rivets in chain riveting at a gauge of 60 mm. What is the efficiency of the joint? Adopt working stresses in rivets and flats as per IS: 800 – 1984.
6. A load of 150 kN is applied to a bracket plate at an eccentricity of 300 mm. sixteen rivets of 20 mm nominal diameter are arranged in two rows with 8 rivets per row. The two rows are 200 mm apart and the pitch is 80 mm. if the bracket plate is 12.5 mm thick, investigate the safety of the connection. Given, s = 100 N / mm2, fb = 300 N / mm2 and ft = 150 N / mm2. 4. What are the types of load to be account for steel design?
7. A bridge truss carries an axial pull of 400 KN. It is to be a gusset plate 22mm thick by a double cover butt joint with 22 mm diameter power driven rivets. Design an economical joint. Determine the efficiency of the joint.

CHAPTER-III

1. Write note on Load-elongation of tension member
2. How Angle sections eccentrically loaded through gussets plate?
3.Write down the formula for finding out the net effective area for angles and Tees in tension.
4. A tie of a roof truss consists of double angles ISA 100X75X10 mm with its short legs back to back and long legs connected to the same side of a gusset plate, with 16mm diameter rivets. Determine the strength of tie in axial tension, taking ft = 150 N/mm2. Take rivets have been provided at suitable pitch.

5. Using a lug angle, design a suitable joint for 100 mm * 65mm *10 mm angle, used as a tension member .use 20 mm diameter rivets and thickness of gusset plate 8 mm.
6 . The bottom tie of roof truss is 4m long .in addition to an axial tension of 1000 KN,it has to support at its centre a shaft of load of 3600N. The member is composed of two angles 100 mm * 75 mm* 10 mm with the longer legs turned down and placed back to back on either side of 10 mm gusset plate. The angles are tack riveted at 92 cm centres with 20 mm diameter rivets. 3. Design a horizontal tension member carrying a load 600 KN, The length of the member is 3 mm. The member is connected to 4.5 cm thick gusset plate 20 mm rivets.
7. Design a tension member of heavy truss carrying a force of 4400 KN, length of the member being 10 metres.
8. A bridge truss diagonal carries an axial pull of 300 KN .two mild steel flats 250 ISF 10 and ISF 18 of the diagonal are to be jointed together. Design a suitable splice
9. Determine the design tensile strength of the plate (200 X 10 mm) with the holes as Shown below, if the yield strength and the ultimate strength of the steel used are 250 MPa and 420 MPa and 20 mm diameter bolts are used.fy = 250 Mpa;fu = 420 MPa
10. Design a single angle tension member carrying axial load of 300 kN in addition to this, it is also subjected to a uniformly distributed load of 0.4kN/m throughout its length, including self-weight. The centre to centre distance between the end connections is 2.7m.
11. Design a tension splice connect two plates of size 220mmX20mm and 200mmX10mm, for a design load of 220kN. Also sketch the details of the riveted joint.
12. Determine the tensile strength of a roof truss diagonal 100X75X10mm connected to the gusset plate by 20mm diameter power driven rivets in one row along the length of the member. The short leg of the of the angle is kept outstanding.
13. The main tie of a roof truss consists of ISA 150X115X8mm and is connected to a gusset plate by 18mm diameter rivets. Find out the maximum load it can carry

CHAPTER-IV

1. Design a simply supported beam to carry uniformly distributed load of 44 kn/m.the effective Span of beam is 8 m. The effective length of compression flange of the beam is also 8 m. The ends of beam are not to free to rotate at the bearings.
2. The effective length of compression flange of simply supported beam MB 500 @ 0.869 kn/m. Determine the safe uniformly distributed load per metre

length which can be placed over the beam having an effective span of 8 m. The ends of beam are restrained against rotation at the bearings.
3. ISMB 550 @1.037 kn/ m has been used as simply supported over a span of 4 m .the ends of beam are restrained against torsion but not against lateral bending. Determine the safe UDL per metre, which the beam can carry.
4.Design rolled steel I- sections for a simply supported beam with a clear span of 6m .it carries a UDL of 50 KN per metre exclusive of self-weight of the girder .the beam is laterally unsupported.
5. Check the beam section WB 500 @1.45 kn/m against web crippling and web buckling if reaction at the end of beam is 179.6 KN, The length of bearing plate at the support is 120 mm. Design bearing plate. The bearing plate is set in masonry.
6. A beam simply supported over an effective span of 7m, carries an uniformly distributed load of 50kN/m inclusive of its own weight. The depth of the beam is restricted to 450mm. design the beam, assuming that the compression flange of the beam is laterally supported by a floor construction. Take fy = 250N/mm2 and E = 2X105N/mm2. Assuming width of the support is 230mm.
7. Design a bearing stiffener for a welded plate girder with the following specifications. Web = 1000mm X6mm thick. Flanges = 2 Nos. of 350X20mm plate on each side. Support reaction = 350kN. Width of the support = 300mm..
8. A simply supported steel joist with a 4.0m effective span carries audl of 40kN/m over its span inclusive of self weight. The beam is laterally unsupported. Design a suitable section. Take fy = 250N/mm2.
9. Design the step by step procedure for design of vertical and horizontal stiffeners in a plate girder.

CHAPTER-V

1. A roof truss- shed is to be built Jodhpur city area for an industrial use. Determine the basic wind pressure .The use of shed 18 m* 30 m
2. An industrial roof shed of size 20 m* 30 m is proposed to be constructed at Mangalore near a hillock of 160 m and slope is 1 in 2.8. The roof shed is to be built at a height of 120 m from the base of the hill. Determine the design wind pressure on the slope. The height of roof shed shall be 12m
3.A communications tower of 80 m height is proposed to be built hill top height 520 m with a gradient of 1in 5. The horizontal approach distance is 2.8 m km from the level ground .The tower is proposed at Abu mount .Determine the design wind pressure.

4. Locate the principal axes of ISA 200 mm* 100 mm * 10 mm. Determine principal moment of inertia and radius of gyration about the principal axes for this angle section.
5. LB 200 @ 0.198 kN/m is subjected to bending moment 12 kN-m. The plate of loading passes through centroid of beam and it is inclined 8o with the YY-axis in the anticlockwise direction. Locate the neutral axis. Determine maximum bending stress induced stress in the beam section.
6. Design a purlin for a roof truss having the following data: Span of the truss = 6.0m Spacing of truss = 3m c/c. Inclination of roof = 30o Spacing of Purlin = 2m c/c Wind pressure = 1.5 kN/m2 Roof coverage = A.C Sheeting weighing 200 N/m2 Provide a channel section Purlin.
7. Design a gantry girder to be used in an industrial building carrying an EOT crane for the following data: Crane capacity = 200 kN. Total self-weight of all components = 240 kN. Minimum approach at th carne hook of gantry girder = 1.2m Wheel base = 3.5m C/C distance between gantry rails = 16m C/C distance between columns = 8m Self weight of rail section = 300 N/m Yield stress = 250 N/mm2 Design the main gantry section. Connection design not required.

8. Design the angle purlin for the following specifications: Span of truss = 9m c/c. Pitch = 1/5 of span Spacing of purlin = 1.4 c/c. Load from roofing material = 200 N/m2. Wind load = 1200 N/m2.
9. Determine the dead load, live load and wind load on a FINK type truss for the following data and mark the loads on the nodes of the truss. Span = 12m Pitch = ¼ of span Height at eves level = 10m from the ground Spacing of truss = 5m c/c.
10. Design the step by step procedure for design of vertical and horizontal stiffeners in a plate girder.