MUTHAYAMMAL ENGINEERING COLLEGE, RASIPURAM-637408
(AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING
QUESTION BANK
(Regulation-2019)

YEAR/SEM : III/VI
SUB.CODE&NAME: 19CEC04 & DESIGN OF STEEL STRUCTURES

UNIT I

INTRODUCTION

PART- A TWO MARKS

1. Mention the types of failures?	(Apr/May 2014)
2. Define Efficiency of joints?	(Apr/May 2014)
3. Define Pitch of a Rivet?	(Apr/May 2012)
4. What do you mean by splitting of plates?	(Apr/May 2012)
5. Classify structures based on structure and Geometry?	(Apr/May 2013)
6. What is Riveting?	(Apr/May 2013)
7. What is mean by Design Load?	(Apr/May 2015)
8. How do you calculate Effective throat Thickness?	(Apr/May 2015)
9. What is meant by strength of Fillet Weld?	(Apr/May 2016)
10. Define Bolt Value?	(Apr/May 2016)
11. State any four advantages of welded connections?	(Nov/Dec 2013)
12. What are the advantages of a welded connection when compared to bolt?	(Nov/Dec 2013)
13. Define Nominal Diameter of a Rivet?	(Nov/Dec 2014)
14. Formulate the equation for calculating the Effective Throat Thickness of weld?	(Nov/Dec 2014)
15. Illustrate the advantages of HFSG Bolts?	(Nov/Dec 2015)
16. Draw the Stress-Strain curve for mild steel bar showing the salient points?	(Nov/Dec 2015)
17. List out the failure of Bolted Joints?	(Nov/Dec 2016)
18. How is the Efficiency of a bolted connection Estimated?	(Nov/Dec 2016)
19. What do you understand by Prying Action?	(Nov/Dec 2017)
20. List out the Short notes on High Tension Bolts?	(Nov/Dec 2017)

PART B SIXTEEN MARKS

1. Two plates 200mmx8mm of grade of Fe 410 are connected by 20mm diameter bolts of grade of 4.6 using Butt Joint. Design the Bolted Connection to Transmit a Pull Equal to the Strength of the plate. Also sketch the Arrangement of the bolts in the Joints? (May/June 2014)

2. An ISA 100mmx100mmx10mm angle is to be the Welded in shop to 12mm thick Gusset plate The angle carries an ultimate pull of 300KN applied along its centroidal axis.The length of Side fillet welds requires at Heel and Toe of the Angle. (May/June 2011)

3. A single riveted Double cover Butt Joint is used to connect to two plates of 12mm thick. The rivets used are Power Driven 18mm in diameter at a pitch of 60mm. Find the Safe load per Pitch Length and the Efficiency of the joint. (May/June 2012)

4. A tie member consist of angle section 80mmx50mmx8mm welded to an 8mm Gusset plate. Design the Weld to transmit the Load equal to the Full strength of the member. (May/June 2014)

5. Design a Double Bolted Lap Joint for plates 16mm thick to carry it's fully load. Take permissible Axial Tension in the Plate as 150N/mm2. (Apr/May 2013)

6. A single Riveted Lap joint is used to connect plate of 12mm thick if 22mm dia. Power driven rivets are used at 70mm spacing. Determine the strength of the Joint and its efficiency.

7. Draw a typical Stress Strain for mild steel and explain the salient points on it. Also explain the Mechanical property of mild steel. (Apr/May 2015)

8. A Two plates (200mmx8mmx) of Grade 410 are connected by 20mm Bots using Butt Joint. Design the Bolted connection to transmit a Pull Equal To the strength of plate. Bolt grade 4.6. (Apr/May 2015)

9. A Two plates 110mm and 14mm thick are to be joined by Double cover Butt joint. Assuming Cover plates of 8mm Thickness, Design the Joints to transmit a Factored Load of 300KN. Using Fe 410 and 10mm diameter and 4.6. (Apr/May 2016)

10. A Tie Member of Truss consist of ISA 65x65x6mm of Fe410 grade is welded to an 8mm Gusset plate. Design a suitable weld to transmit a load Equal to its Full strength of the Member, Providing
    i) Weld on two sides of the angle;
    ii) % of three sides, Assuming Shop Welding. (Apr/May 2016)

11. Design a Double Bolted Lap Joint for plates 16mm thick to carry its full load. Take permissible axial tension in plate 150N/mm^2 .Use 16mm Diameter Bolts of Grade 4.6 (Apr/May 2017)

12. A 100mmx10mm plate is to be welded to another plate 150mmx10mm by Fillet welding on three sides. The size of the weld is 6mm. Find out necessary overlap of the plate , for full strength of the joint .Take Allowable Tensile Stress in plate equal to 150N/mm^2 and allowable stress in weld as 110N/mm^2 . (Apr/May 2017)

13. An ISMC 300 is to be connected at site to a 12mm thick gusset plate through its web using fillet welds to transfer Tension equal to the capacity of the section. Design the welded connection when the overlap is limited to 250mm. (Apr/May 2018)

14. Design Welded End Connections for a Tension member consisting of a Channel ISMC 300 to Develop Full strength of the member. The Length of the joint is Limited to 25cm. (Nov/Dec 2016)

15. A single riveted lap joint is used to connect plate of 12mm thickness if 22mm Diameter. Power driven rivets are used at 70mm Spacing. Determine the strength of the joint and its efficiency. (Nov/Dec 2013)

UNIT-II

TENSION MEMBERS

PART- A TWO MARKS

1. List out the different types of tension steel members. (April/May-2017)
2. What is shear lag? (April/May-2017)
3. What is net sectional area? (April/May-2018)
4. What is block shear failure? (Nov/Dec 2013)
5. What are lug angles? (Nov/Dec 2013)
6. Write down the expression for calculating the net effective area for angles and toes in tension. (May/June-2013)
7. List out the different types of bolts. (May/June-2012)
8. Measure the maximum pitch when the angels are placed back to back?
9. Select any two typical cross sections of tension member using angle sections with neat sketch.
10. Plan two specifications for designing of lug angle
11. Investigate the design strength due to block shear.
12. Examine lug angle and its use?
13. Illustrate built-up members?
14. Discuss Shear Lag in Tension member?
15. Discuss Tension Splice.
16. Distinguish Net sectional and gross area?
17. Classify the modes of failure in Tension member.
18. Name the types of steel sections used as tension members.
19. When gusset plates are used?
20. Write the expression for calculating net area for angle and T- section in tension.

PART-B SIXTEEN MARKS

1. An angle section 50 x 30 x 6mm is used as a tension member with its longer leg connected by 12mm diameter rivets. Calculate its strength. Also calculate its strength when if it is fillet welded. (April/May-2018)

2. Design a tension member carrying a load 600KN. The length of the member is 2.5m. The member is connected to 12mm thick gusset plate 20mm bolts. (April/May-2018)

3. Determine the tensile strength of a roof truss diagonal 100x75x10mm connected to the gusset plate by 4nos of 20mm diameter power driven rivets in one row along the length of the member. The short leg of the angle is kept outstanding.

4. Design an angle section to carry a factored tensile force of 200KN. Bolts of 20mm diameter of grade 4.6 are to be provided for the connection of the members to the gusset plate. Use fy =250MPa, and fu=410Mpa.

5. A tension member consist of two angles 80x10x6mm bolted to opposite sides of 12mm thick gusset plate using single row of 5nos of 20mm diameter bolts at a distance of 35mm from the toe of angle. Take pitch as 50mm and end distance =40mm.the length of the member is 4m. Use fe410 grade steel. Determine the maximum load that the member can carry. What will be the load carrying capacity if the angles are connected on the same side of the gusset?(Nov/Dec 2016)

6. Find the tensile load carrying capacity of 2ISA 75X75X8 mm placed back to back of 10mm thick gusset plate using a single row of 4 nos 16mm dia bolts at a distance of 40mm from the toe of the angle. Take pitch =50mm and end distance =30mm. The length of the member is 4m.Use Fe 410grade steel. (Nov/Dec 2013)

7. Design a tension member to carry an axial load of 300KN.The 3m long tension member is connected to the gusset plate 16mm thick. With one line of 20mm dia of bolts of grade 4.6.Use Fe 410 grade steel. (Nov/Dec 2013)

8. Design a tension splice to connect two plates of size 250mmx20mm and 220mmx 12mm, for a design load of 250KN. (May/June-2013)

9. Design a tension member of length 3.6m between c/c of intersections and carrying a pull of 150KN .The member is subjected to reversal of stresses. (May/June-2012)

10. Design a tension member to carry a load of 300KN.Two angles placed back to back with long leg outstanding are desirable. The length of the member is 3m. (May/June-2012)

UNIT-III

COMPRESSION MEMBERS

PART- A TWO MARKS

1. Define slenderness ratio. (April/May-2017)
2. State the functions of column bases. (April/May-2017)
3. What is meant by a strut? (April/May-2018)
4. What are the assumptions made in Euler's analysis? (April/May-2018)
5. Write the steps in the design of column slab base connection. (Nov/Dec - 2013)
6. What is the significance of column buckling curves? (Nov/Dec - 2013)
7. Define effective length of column. (May/June -2016)
8. What do you mean by latticed column? (May/June -2012)
9. List out the uses of lug angles. (May/June -2012)
10. What is the purpose of gusset plate? (Nov/Dec- 2015)
11. Define compression member and slenderness ratio
12. Distinguish column and strut
13. State the uses of providing column base?
14. What do you mean by web buckling?
15. Classify the modes of failure in compression member.
16. Illustrate the lateral systems that are used in compound columns.
17. Explain effective sectional area in column design
18. Why lacings are used in compression members?
19. What do you mean by latticed column
20. Where should the splice plate be located in a column?

PART B SIXTEEN MARKS

1. Design a column using rolled steel section to carry a factored axial load of 300KN. The column is 6m long and is effectively held in position and restrained against rotation at both ends. (April/May-2018)

2. Find the axial load carrying capacity of a stanchion ISMB 300, 5m high. The column is pinned at both the ends. (April/May-2018)

3. Calculate the compressive resistance of a compound column consisting of ISMB500 with one cover plate 350x20mm on each flange and having a length of 5m.Assume that the column is fixed and top is rotation fixed translation free. Take fy=250N/mm^2. (Nov/Dec-2016)

4. A steel column ISHB 400 @ 759.3N/mm is subjected to a factored axial load of 2000KN.Design a slab base plate for the column. Assume that the bearing surfaces of the column and base plate are machined and the concrete footing is M20 grade. (Nov/Dec-2016)

5. Find the axial load carrying capacity of a stanchion ISMB 300,5m high. The column is pinned at both ends, fy=250MPa. (Nov/Dec-2016)

6. Design a column to carry a factored axial compressive load of 500KN.The effective length of column is 4m take fy=250MPa. (Nov/Dec-2016)

7. Design a steel column of rolled steel I section to carry an axial load of 500KN.The column is 4m long and it is effectively held in position at both ends but restrained against at one end only. Take fy=250N/mm^2. (May/June-2013)

8. Design a build up column composed of two channel sections placed back to back; carrying an axial load of 1345KN.Effective length of column is 5.95m. Take fy=250N/mm^2. (May/June-2013)

9. Design a column with single lacing system to carry a factored axial load of 1500KN. The effective height of column is 4.2m. Use two channels placed toe to toe. (May/June-2012)

10. Design a suitable slab base for a column section ISHB 400@ 822 N/m supporting an axial load 500KN. The base plate is rest on a concrete pedestal of M20 grade concrete. (May/June-2012)

UNIT – IV

BEAMS

PART- A TWO MARKS

1. How is flange curtailment done in plate girders? (Nov-Dec 14)
2. What do you mean by web buckling? (Nov-Dec 14)
3. What do you mean by castellated beam? (Apr-May 15)
4. What is called beam column? (Apr-May 15)
5. Enlist the purpose of bearing stiffeners. (May-Jun 14)
6. What do you mean by shape factor? (May-Jun 14)
7. Why there bearing stiffeners are provided? (Nov-Dec 15)
8. What do you mean by curtailment of flanges? (Nov-Dec 15)
9. How are beam cross-sections classified as per IS 800:2007? (Apr-May 17)
10. List of factors governing flange curtailment in plate girders. (Apr-May 17)

11. What is end post? (May-Jun 15)

12. Define Web splice? Where it is provided? (May-Jun 15)

13. What is mean by slender section? (Nov-Dec 17)

14. What are the classifications in stiffeners? (Nov-Dec 17)

15. What is laterally unsupported beam? Give an example. (May-Jun 17)

16. Write the formula for calculating the thickness of beam bearing plate. (May-Jun 17)

17. What are the different types of stiffeners provided in a plate girder? (Apr-May 18)

18. Why do compression flanges require lateral support? (Apr-May 18)

19. Classify the cross section ISMB 300.(Nov-Dec 16)

20. What is plate girder? Where it is used? (Nov-Dec 16)

PART B SIXTEEN MARKS

1. Design a built up beam station for a span 8m to carry a udl of 15KN/m and central concentrated load of 100KN. The beam is laterally supported. (May-Jun 13 & 14) & (Nov-Dec 12)

2. A simply supported beam of span 3.25m consist of rolled steel section ISLB 325 @ 422.8N/m. Determine the design bending strength of the beam, if the beam is laterally unsupported. (Nov-Dec 16)

3. A welded plate girder of span 25m is laterally restrained throughout its length. It has to carry a load of 80KN/m over the whole span besides its weight. Design the girder without intermediate transverse stiffness. (Nov-Dec 16)

4. Find the suitable design for a simply supported steel joist with a 4m effective span carries a udl of 40KN/m over its span inclusive of self weight. The beam is laterally unsupported. Take $f_y = 250N/mm^2$. (Apr-May 18)

5. Design a simply supported beam of effective span 1.5m carrying a factored concentrated load of 360KN at mid span. (Apr-May 18)

6. Design a laterally restrained simply supported beam to carry a udl of 44KN/m. Effective span of beam is 8m. A bearing length of 75mm is provided at the supports. (Apr-May 17)

7. Design rolled steel I section for a simply supported beam with a clear span of 6m. It carries a UDL of 50KN/m exclusive of self weight of the girder. The beam is laterally unsupported. (Apr-May 17)

8. A simply supported beam of 5m span carries a factored load of 80KN/m over the entire span. The

compressive flange is fully restrained. The rolled steel section available is ISMB 300. Check whether the section is sufficient to resist the moment. (Nov-Dec 16)

9. Design a laterally unsupported beam simply supported over a span of 2m. It carries udl of 56KN/m. (Nov-Dec 16)

10. Design a laterally unrestrained beam of span 5m to carry a dead load 20KN/m and live load of 40KN/m. Check for deflection. (Apr-May 18)

UNIT-V

ROOF TRUSS AND INDUSTRIAL STRUCTURES

PART- A TWO MARKS

1. Draw neat sketches of various types of roof trusses. (April/May-2018)
2. List the various forces acting on gantry girder. (April/May-2018)
3. How do you calculate the wind loads while designing roof trusses? (April/May-2017)
4. What is a purlin? (Nov/Dec-2016)
5. Write the equation to calculate the design wind pressure. (Nov/Dec-2016)
6. On what basis is live load is considered in the design of roof truss? (Nov/Dec -2013)
7. Give the serviceability criteria for the design of gantry girders. (Nov/Dec -2013)
8. What are the different components of roof truss? (May/June-2013)
9. List out the uses of sag rod. (May/June-2012)
10. What is the necessity of curtailment of flange plates in plate girder? (May/June-2012)
11. List out the purpose of principal rafter in a roof truss. (Nov/Dec 2015)
12. Define bracing and why bracings required in roof trusses?
13. Classify the type of truss based on span.
14. List the criteria to be adopted for arriving at the spacing of truss?
15. What are the loads to be considered for the design of gantry girder?
16. What is the purpose of the purlin in a roof truss?
17. Explain about the importance of steel decking.
18. Define Drift Analysis
19. Define pitch of trusses
20. Define end bearing in roof trusses?

PART B SIXTEEN MARKS

1. Design an I- section purlin for the following data.
   - i) Spacing of truss = 6m
   - ii) Spacing of purlin= 1.4m
   - iii) Angle of truss = 29^o
   - iv) Sheet weight = 135 N/m^2
   - v) Imposed load = 1.3 $N/mm^{2.}$ (April/May-2018)

2. Explain in detail the steps involved in the design of gantry girder. (April/May-2018)

3. List out various elements of the roof truss and give their design requirements. (April/May-2017)

4. Design a channel section shape purlin placed on a sloping roof truss with dead load of 0.15KN/m^2 (cladding and insulation), a live load of 2KN/m^2 and wind load of 0.5KN/m^2 (suction).The purlins are spaced 2 m c/c and of span 4m, simply supported a rafter at a slope of 200.(NOV/Dec-2016)

5. Design the purlin for a roof truss of an industrial building located at Chennai with a span of 15m and length 60m. The roofing is AC sheeting. The terrain is an open industrial area. Building is class B building with a clear height of 8m at the eaves. Design for 1.5(DL+WL) combination. Type of roof truss and roof slab can be assumed. (NOV/Dec-2013)

6. Design a purlin using the following data
   - i) Spacing of roof trusses=4.5c/c
   - ii) Purlin spacing=1.8m
   - iii) Pitch of roof=1.4
   - iv) Span of the roof=10m
   - v) The vertical load from roof sheets=180N/M^2
   - vi) Wind load intensity normal to roof=1200N/m^2 Use I section. (May/June-2013)

7. Design an angle purlin for a roof with the following data:
   - i) Span of truss: 8m
   - ii) Spacing of truss: 4m c/c
   - iii) Pitch of truss: ¼
   - iv) Spacing of purlins along the slope truss: 2m c/c
   - v) Roof coverings: Asbestos sheets
   - vi) Basic wind pressure: 1.5KN/sq.m (Nov/Dec 2015)

8. i.Classify the different types of roof truss with neat sketches (8)
   ii.Give general guidelines for fixing spacing of roof trusses (8)

9. Design a purlin for a roof truss having the following data:
    i) Span of the truss = 6.0m
    ii) Spacing of truss = 3m c/c
    iii) Inclination of roof = 30^{o}
    iv) Spacing of Purlin = 2m c/c
    v) Wind pressure = 1.5 kN/m^2
    vi) Roof coverage= A.C Sheeting weighing 200 N/m^2

    Provide a channel section Purlin.

10. Discuss briefly the following with neat sketches.
    i) Bracing system in roof truss
    ii) Connection of purlin to rafter
    iii) Anchorages of truss with concrete column.

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