# Question Bank

**Subject- DSS-I (BCIE1-517) - MRSPTU**

1. What is ductility? Why is it important?
2. What is factor of safety and partial safety factor?
3. Write the various mechanical properties of steel?
4. What is rolled steel section? List the various rolled steel sections with sketches?
5. Define the following terms:
    a. Pitch of rivets/bolts
    b. Nominal diameter of rivet/bolt
    c. Gross diameter of rivet/bolt
    d. Gauge distance
    e. End and edge distance
    f. Staggered pitch of rivets/bolts
    g. Efficiency of joint rivet/bolt
    h. Bolt value of rivet/bolt
    i. Effective throat thickness
    j. Leg length
6. What is the difference between lap and butt joints with sketches?
7. What is the difference between groove (butt) weld and fillet weld?
8. What is the difference between black bolts and HSFG bolts?
9. What is groove welding? List its various types?
10. Write the two advantages and disadvantages of riveted connections?
11. Write the three advantages and disadvantages of bolted connections?
12. Write the four advantages and disadvantages of welded connections?
13. What does 4 and 6 imply for bolts of grade 4.6?
14. Design a lap joint between two plates 12 x 10 mm, so as to transmit factored load of 70 kN. Using M16 grade of bolt 4.6 and Fe 410 grade of steel.
15. A ISA 100 x 100 x 10 mm carries factored tensile force of 100 kN. It is jointed with 12 mm thick gusset plate. Design the HSFG bolt joint
    1. When no slip is permitted
    2. When slip is permitted

    Grade of bolt is 8.8S with 16mm diameter and grade of steel Fe410.
16. Calculate the strength of a 16mm diameter bolt of grade 4.6 for the following cases. The main plates to be jointed are 10mm thick.
    1. Lap joint
    2. Double cover butt joint; each of the cover plate being 8mm thick.
17. Two plates 10 mm and 18 mm thick are the to be jointed by double cover butt joint. Design the joint for the following data

    Factored design load = 750 kN

Bolt diameter = 20 mm
Grade of steel (Fe410)
Grade of bolts (4.6)
Cover plates 2 (one on each side) = 8mm thick.

18. A single bolted double cover butt joint is used to connect two plates which are 8 mm thick. Assuming 16 mm diameter bolts of grade 4.6 and cover plates to be 6 mm thick, calculate the strength and efficacy of the joint if 4 bolts are provided in the bolt line at a pitch of 45 mm as shown in fig.1.
19. A tie member 95 mm x 10 mm is to transmit a factored load of 170 kN. Design the fillet welds and necessary overlaps for the cases shown in fig. Grade of steel Fe410. Assume gusset plate to be 14mm thick.
20. What are the column bases? Why are they provided?
21. Difference between slab base and gusset base with sketches.
22. When do we prefer the grillage footing / Write a short note on grillage footing.
23. What is the purpose of anchor bolts in a base plate?
24. Write the formula for computing thickness of square base of a solid round steel column.
25. Draw bending stress diagram under a column base which is subjected to a point load P at an eccentricity e.
26. Design a slab base for a column section ISHB 350 @ 710.2 N/m subjected to an axial load of 1500 kN. Base is resting on M20 concrete pedestal. Use grade of steel Fe500.
27. Design a suitable bolted gusset base for a column section ISHB 350 @ 724 N/m subjected to an axial load of 4000 kN. Base is resting on M15 concrete pedestal. Safe bearing pressure of concrete is 4000 kN/m 2 .
28. Design a suitable bolted gusset base for a column section ISHB 350 @ 661.2 N/m subjected to an axial load of 1700 kN. Base is resting on M15 concrete pedestal. Use 24 mm diameter bolts of grade 4.6 for making the connections.
29. Design a base for the column section ISHB 350 subjected to an axial load of 3000 KN. The base is resting on M15 concrete pedestal. Assume bearing strength of concrete is 4MPa.

1. What is tension member?

2. List the different modes of failure of a tension member.

3. What is shear lag effect?

4. What is meant by net sectional area of a tension member? How are determined net

area for plates for chain and zig-zag (staggered) bolting?

5. Write a short note on

1. Lug angles

2. Splices

3. Gusset Plate

4. Length of end connection (L c )

6. A 250 ISF 8 mm of grade Fe 410 is used as a tension member in a lattice girder. It is connected to a 12 mm thick gusset plate by 16 mm diameter bolts of grade 4.6. Calculate the effective net area of the member, if

1. Chain bolting is done as shown in fig.

2. Zia-Zag bolting is done as shown in fig.

7. Determine the effective net area for the tension member as shown in fig. The angles are connected as shown in the fig. Use grade of steel Fe410.

8. Determine the effective net area of double angle section connected to a gusset plate 12 mm in thickness as shown in the fig. Use grade of steel Fe410.

9. Compute the tensile strength of an angle section ISA 200x100x10mm of Fe410 grade of steel connected with the gusset plate as shown in fig. for the following cases

1. Gross section yielding

2. Net section rupture

10. Determine the block shear strength of the welded and bolted tension member as shown in fig. Use the grade of steel Fe410.

11. A tension member 0.95 m long to resist a service dead load of 20 kN and a service live load of 60kN. Design a rectangular bar of standard structural steel of grade Fe410. Assume that the member is connected by one line of 16 mm diameter bolts of grade 4.6.

12. Design a bridge truss diagonal subjected to a tensile load of 300 kN. The length of diagonal is 3m. The tension member is connected to a gusset plate 16 mm thick with one line of 20 mm diameter bolts of grade 8.8.

13. Design a tension member to transmit a pull of 150kN. Effective length of member is 4.5 meters. Member should consist of a pair of angles connected to both sides of gusset plate.

1. Difference between column and strut.

2. Difference between short column and long column.

3. What is slenderness ratio? How does it affect the load carrying capacity of a column?

4. Give maximum and minimum value of angle of inclination for laced column. / What is the recommend value of minimum and maximum inclination of a lacing bar?

5. What is the maximum slenderness ratio recommended for a member carrying compressive loads resulting from dead load and superimposed load?

6. What is the recommended value of effective length of a compression member if it is effectively held in position at both ends, but not restrained against rotation. The unsupported length is 5m.

7. Write the Euler's formula for long and short pinned ended column.

8. Compression members are more critical than tension members. Comments.

9. Give the factor by which effective length of battened column is altered.

10. Difference between lacing and batten.

11. Design a column to support a factored load of 1050 kN. The column has an effective length of 7 m with respect to z-axis and 5 m with respect to y-axis. Use steel of grade Fe410.

12. Design a column with effective length 7m. It is subjected to an axial load of 1500 kN. Provide two channel sections placed back to back with lacing. Design suitable lacing system also.

13. Design a double angle discontinuous strut to carry a factored load of 135 kN. The length of strut is 3 m between intersections. The two angles are placed back to back (with long legs connected). Use steel of grade Fe410.

a. Angles are placed on opposite sides of 12 mm gusset plate(ISA 70 x 70 x 6 mm)

b. Angles are placed on same sides of 12 mm gusset plate(ISA 80 x 80 x 6 mm)

14. Write short note on:

(a) Design of columns using battening system.

1. What are Purlins?

2. Difference between purlins and girt.

3. What are laterally supported and unsupported beams?

4. What is plastic section modulus and shape factor?

5. Difference between web buckling and web crippling with sketches.

6. Design a laterally unsupported beam with 6 m simply supported effective span, subjected to UDL of 20 kN/m over entire span and a point load of 40 kN at mid span. Depth of beam is restricted to 350 mm.

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1. What are the different load combinations of roof trusses?

2. Draw a ,roof truss and label following members on ,it: (i) upper chord member (ii) lower chord member (iii) prinCipal rafter (iv) purlin.

3. Write short note on:

(a) Economical spacing of roof trusses.