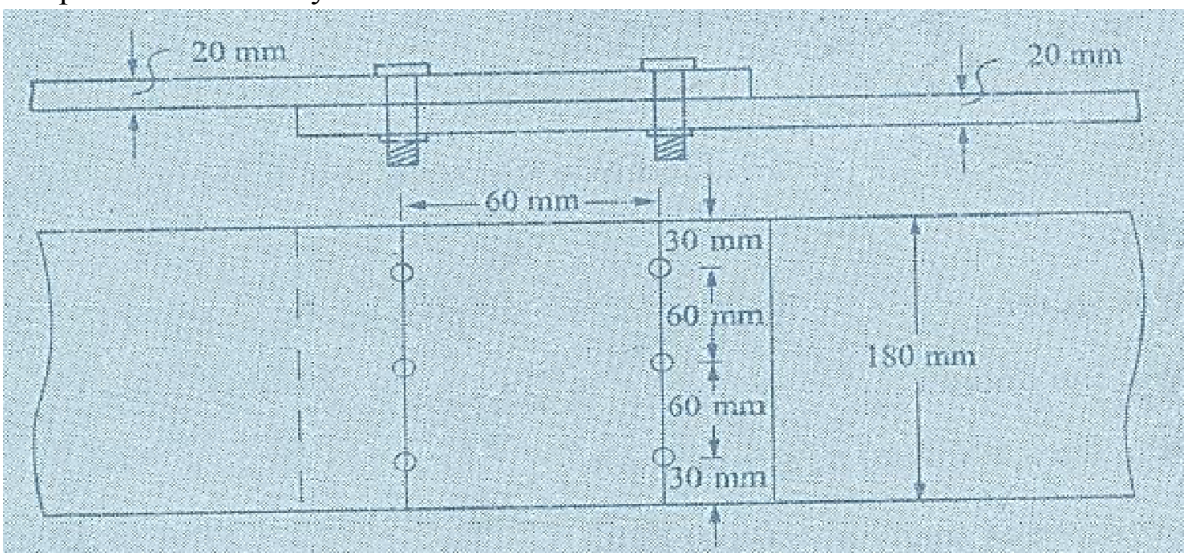
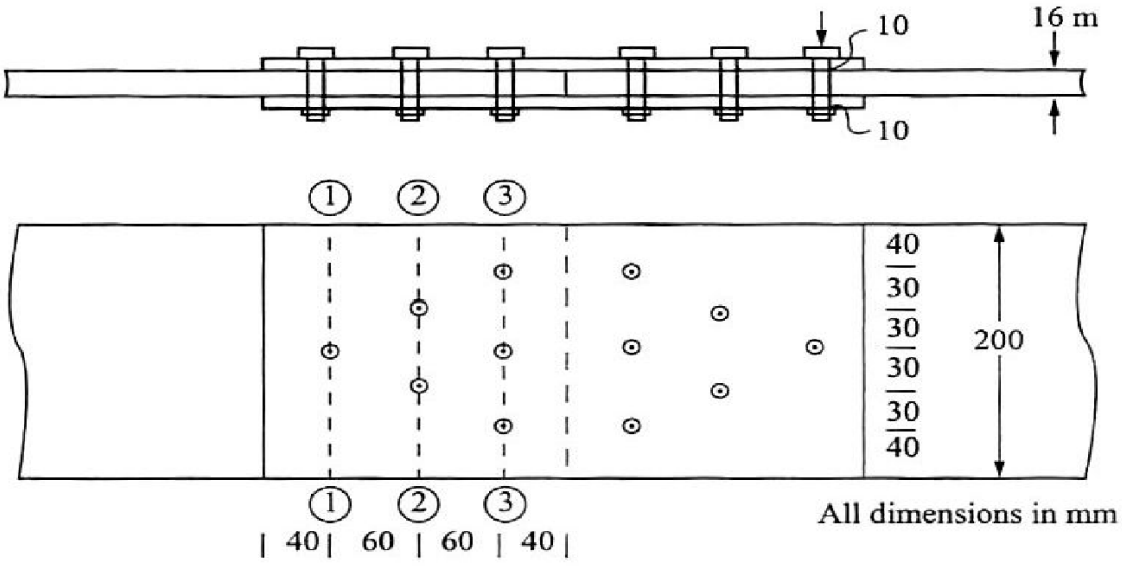
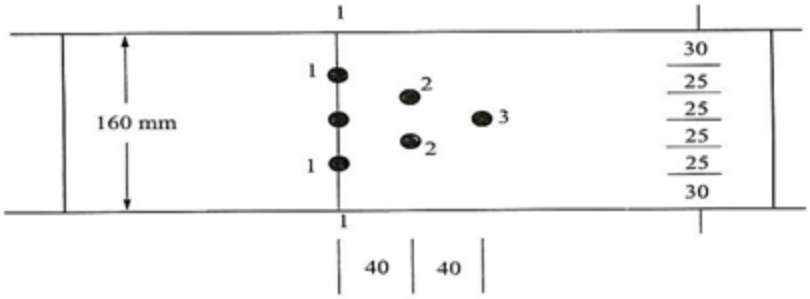
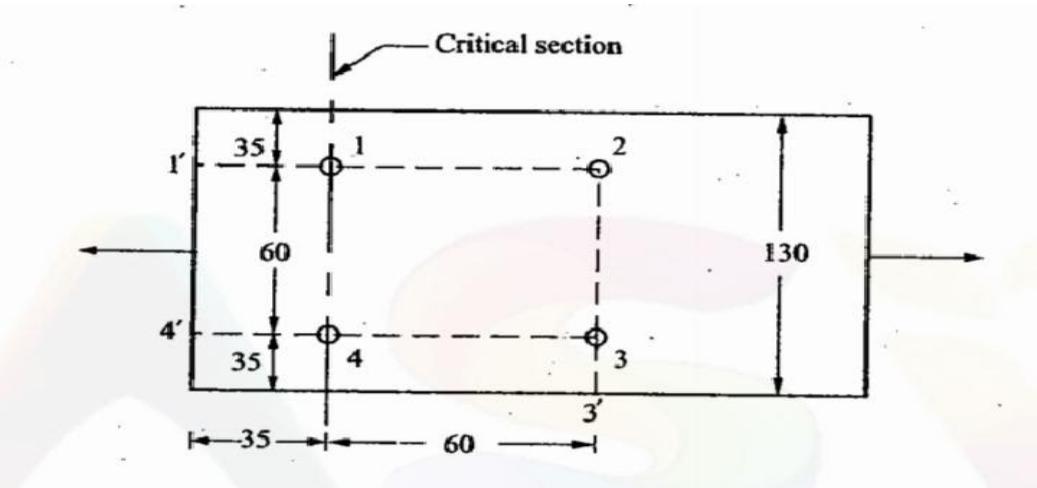
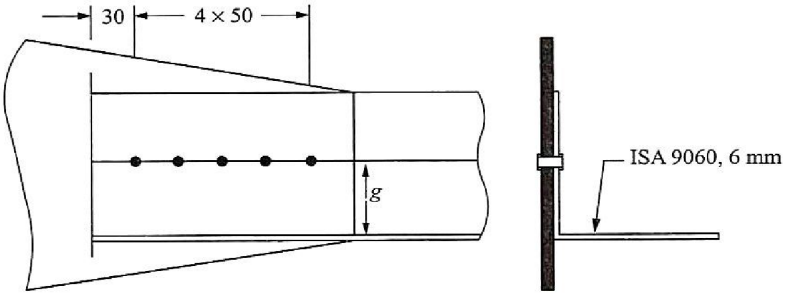
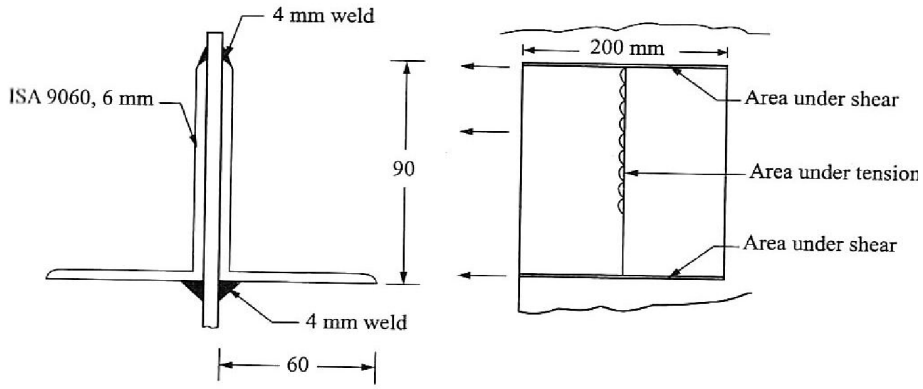
QUESTION BANK ON STEEL STRUCTURES

INTRODUCTION & CONNECTIONS	
Q.NO.	**PART-A (TWO MARKS QUESTIONS)**
1	Write down the different parts of building design.
2	Why steel is used in constructing columns of structure?
3	Write down the physical properties of structural steel and its value.
4	Define rolled steel sections and its types.
5	Write down the full form of ISWB, ISST, ISMC and ISRO.
6	Write down the codal provision for minimum thickness of steel section.
7	What are the various types of connections used for connecting the structural members?
8	Write down the Unit weight of steel and R.C.C .
9	What are the various types of load consider for design of steel structure?
10	What are the various types of load combinations recommended by IS 875?
11	Write down the different method of structural analysis.
12	Define Characteristic strength of steel.
13	Write down the partial safety factor for material Resistance governed by yielding & buckling.
14	Define nominal diameter and gross diameter of rivet
15	What is meant by gauge distance and edge distance?
16	Define staggered pitch with neat sketch.
17	What is meant by pitches of rivet and gauge line?
18	What are the types of riveted joints?
19	Write down the types of failures occur in riveted joint.
20	What are the various types of bolts used for structural purposes?
21	How to calculate the efficiency of a joint?
22	Define “HSFG” Bolt.
23	Define riveting?
24	What is meant by splitting of plates?

25	Define the effective area of butt weld.
29	Write down the various types of welded joints.
30	Write down the formula for strength of fillet weld
31	Define effective throat thickness of a butt weld.
32	Arrange the double riveted lap joint with neat sketch.
33	Write down the properties of Grade 4.6 bolt
34	Define Tacking bolt.
35	Distinguish between Bearing bolt & friction bolt.
36	Define slot weld & plug weld.
37	Define size of butt weld.
38	Define size of fillet weld & write down the value of minimum size of fillet weld.
39	Define Reinforcement.
40	Define Welding.
41	Define effective area of weld.
42	List out the types of butt weld.
43	Define effective length of fillet weld.
44	What do you mean by Intermittent fillet weld.
45	Draw the details of ISMB 350.
46	Write down the equation of shear capacity of a bolt.
Q.NO.	**PART-B (Five Marks Questions)**
1	Explain advantages & disadvantages of steel structure.
2	Define Limit state & Explain various types of limit state.
3	Write down the advantages & disadvantages of bolted connection.
4	What are the advantages of HSFG bolt over bearing bolt.
5	What are the assumptions made for designing of bearing bolt?
6	Write down the code recommendation for minimum and maximum pitch of rivet.
7	What are the merits and demerits of welded connection?
8	Calculate the bolt value of a M20 bolt used in a single cover butt joint. The thickness of plate is 16 mm & cover plate is 12mm.The grade of plate is Fe 410 and grade of bolt is 4.6.Take e=40mm & Pitch=60mm.
9	Explain the special consideration taken in steel design.
Q.NO.	**PART-C (Ten Marks Questions)**

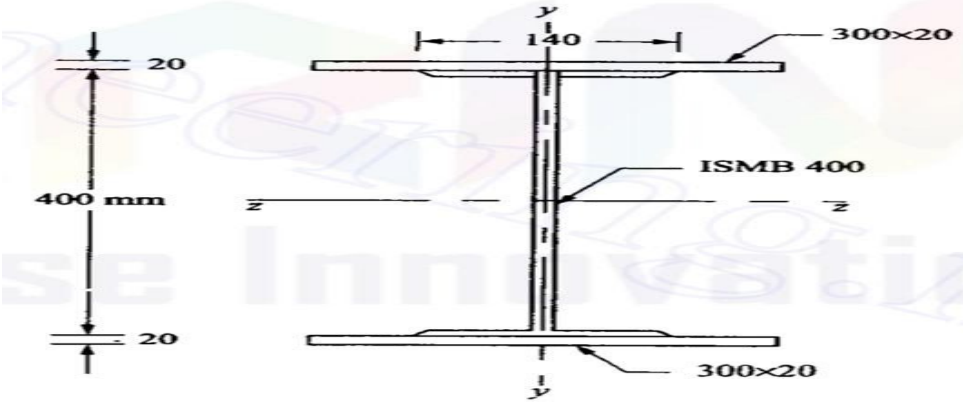
1	Calculate the efficiency of the lap joint shown in fig. use M20 bolts of grade 4.6 and Fe 410 plates. Assume any other data. 
2	Determine the design strength of a 22mm diameter bolt for the cases given below a) Lap joint b) single cover butt joint with 12 mm cover plate c) double cover butt joint with 10 mm cover plates Main plate is 16 mm thick. Use 4.6 grade bolts & Fe 410 grade plate.
3	Design a lap joint between the two plates each of width 120mm, if the thickness of one plate is 16mm and the other is 12mm. the joint has to transfer a design load of 180Kn. The plates are of Fe410 grade. Use bearing type bolts.
4	Find the maximum force which can be transferred through the double cover butt joint shown in fig. below. Use M20 bolts of grade 4.6 and Fe 410 steel plates. 

TENSION MEMBERS	
Q.NO.	**PART-A (TWO MARKS QUESTIONS)**
1	Define tension member?
2	What are the different types of tension members?
3	What do you understand by Gross area and Net Area?
4	Classify the modes of failure in Tension member.
5	What do you mean by net effective area?
6	Draw any two typical cross sections of tension member using angle sections with neat sketch.
7	Write down the limiting slenderness ratio for a tension member.
8	When gusset plates are used?
9	What is a Lug angle & Where it is used?
10	What is block shear failure?
11	Write down the expression for calculating the net effective areas for angles and tees in tension.
12	What is the formula for design strength due to yielding of critical section?
Q.NO.	**PART-B (FIVE MARKS QUESTIONS)**
1	Write down the procedure adopted for designing a tension member.
2	Determine the net area of (160x8) mm plate with the holes for 16mm bolts as shown in fig. plates are of steel, grade Fe415. 
3	Explain in detail about the modes of failure in Tension members.
Q.NO.	**PART-C (TEN MARKS QUESTIONS)**
1	Determine the design tensile strength of plate (130×12) mm with the holes for 16 mm dia bolt as shown in fig. Use Fe 410 grade of plate.

	
2	A single unequal angle ISA90x60x6 mm is connected to a 12mm gusset plate at the ends with 4 nos of 16mm bolts to transfer tension as shown. Determine the design tensile strength of the angle a) If the gusset is connected to 90mm leg b) If the gusset is connected to 60mm leg  g =50 mm, if 90 mm leg is connected =30 mm, if 60 mm leg is connected
3	Determine the tensile strength of a roof truss member 2 ISA 90mm x 60mm x 6mm connected to the gusset plate of 8mm plate by 4mm weld as shown in fig. The effective length of weld is 200mm. 
4	Design a single angle section for a tension member of a roof truss to carry a factored tensile force of 205 KN. The member is subjected to the possible reversal of stress due to

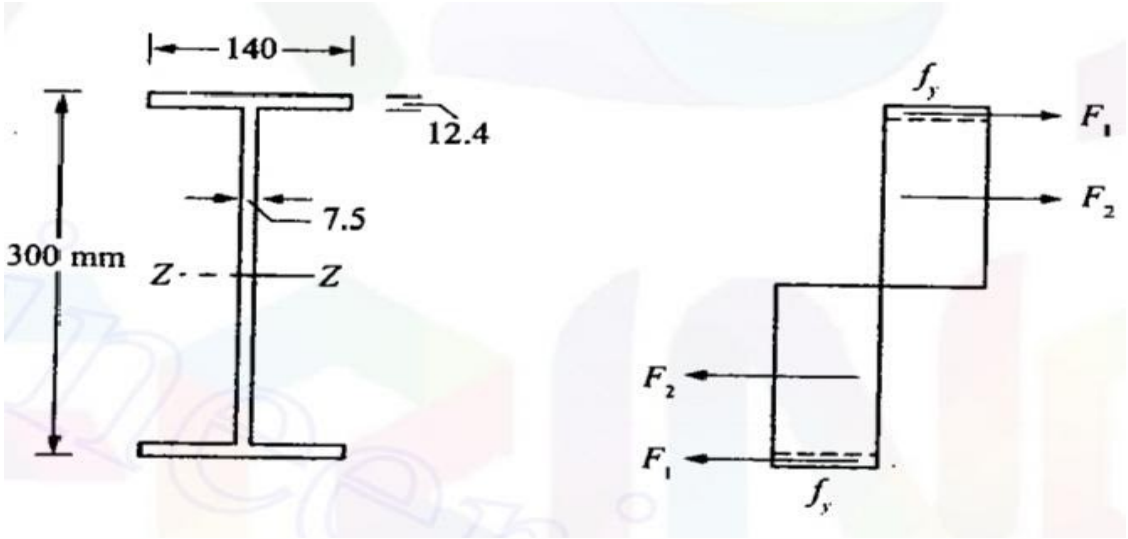
	the action of wind. The effective length of the member is 3m. Use 20mm shop bolts of grade 4.6 for the connection
5	Design a double angle tension member connected on each side of a 10 mm thick gusset plate , to carry an axial factored load 375 KN. Use 20mm black bolt & shop connection.

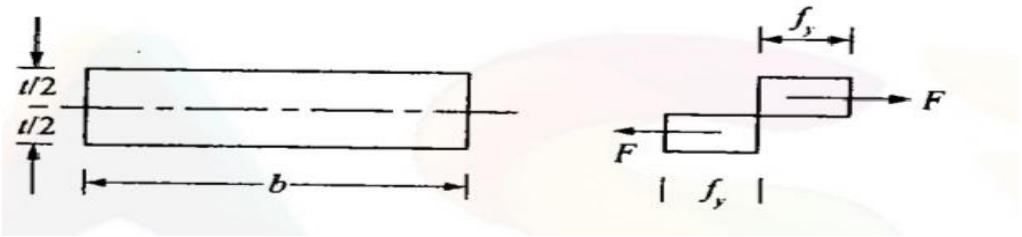
COMPRESSION MEMBERS	
Q.NO.	**PART-A (TWO MARKS QUESTIONS)**
1	Define compression member.
2	List the various types of compression members.
3	Distinguish column and strut.
4	Define effective length of a column.
5	Define slenderness ratio of compression member.
6	Define Radius of gyration.
7	Draw the diagram of buckling of column and mention its significance.
8	What are the types of buckling in a compression member?
9	What will be the buckling class of ISHB 400@907 N/m about the z-z and y-y axes?
10	What is the value of effective length of compression member in case of effectively held in position at both ends restrained against rotation at one end.
11	What do you mean by eccentrically loaded column?
Q.NO.	**PART-B (FIVE MARKS QUESTIONS)**
1	What are Steps involved in the design of axially loaded columns?
2	Explain buckling class of cross-sections in a compression member.
3	Explain the step by step procedure for finding the load carrying capacity of a compression member.
Q.NO.	**PART-B (10 MARKS QUESTIONS)**
1	Determine the design load capacity of the column ISHB 300 @ 577 N/m if the length of column is 3m and its both ends pinned.

2	Determine the load carrying capacity of the column section shown in fig. If its actual length is 4.5m.its one end may be assumed fixed and other end hinged. The grade of steel is Fe415. 
3	Design a single angle strut connect to the gusset plate to carry 160KN factored load. The length of the strut between centre to centre connection is 3m.
4	A column 4m long has to support a working load of 4000 KN. The column is effectively held at both ends and restrained in direction at one of the ends. Design the column using beam sections and plates.

STEEL COLUMN BASES & FOUNDATIONS	
Q.NO.	**PART-A (TWO MARKS QUESTIONS)**
1	State the uses of providing column base?
2	Distinguish slab base and gusseted base.
3	What are the different types of column base connections?
4	Draw the neat sketch of a bolted slab base.
5	Under what circumstances is a gusset base used?
6	What is the purpose for providing anchor bolt in the base plate?
Q.NO.	**PART-B (FIVE MARKS QUESTIONS)**
1	Write down the step by step procedure for designing of a slab base.
2	Write down the step by step procedure for designing of a gusset base.
Q.NO.	**PART-B (10 MARKS QUESTIONS)**
1	Design a slab base for a column ISHB 300 @577N/m carrying an axial working load of 750 kN.M20 concrete is used for the foundation. Provide welded connection between column and base plate.
2	Design a gusseted base for a column ISHB 350 @710N/m with two plates 450mmx20mm carrying a working load of 2400 kN. The column is to be

	supported on concrete pedestal to be built with M20 concrete.

DESIGN OF STEEL BEAMS	
Q.NO.	**PART-A (TWO MARKS QUESTIONS)**
1	Define shape factor and what is meant by slender section?
2	What is web crippling?
3	What is laterally unsupported beam? Give an example.
4	Define web buckling.
5	Define built up beams.
6	What do you mean by Plastic moment and plastic neutral axis?
7	Define plastic hinge.
8	Define compact section.
9	List the various factors affecting the lateral-torsional buckling strength .
10	Define plastic section modulus.
Q.NO.	**PART-B (FIVE MARKS QUESTIONS)**
1	Classify the various types of beam cross-sections according to code.
2	Determine Plastic moment capacity and plastic section modulus of the rectangular section of size (b× t) mm about z-z axis as shown in fig.
3	Determine Plastic moment capacity and plastic section modulus of the I-section about z-z axis as shown in fig. 

	
Q.NO.	**PART-B (10 MARKS QUESTIONS)**
1	Design a simply supported beam of effective span 1.5m carrying a factored concentrated load of 360 kN at mid span.
2	Design a simply supported beam of 10m effective span carrying a total load of 60 kN/m. the depth of beam should not exceed 500mm.the compression flange of the beam is laterally supported by floor construction. Assume stiff end bearing is 75mm.

DESIGN OF TIMBER STRUCTURES	
Q.NO.	**PART-A (TWO MARKS QUESTIONS)**
1	Classify the types of timber according to code.
2	Define select timber.
3	Define Timber column & its types.
4	Write down the formula for compressive stress of different types of solid column.
5	Write down the different types of box column.
6	Draw the neat sketch of the sold column, Box column and built up column.
7	Define form factor & what its value for solid circular and square cross section?
8	Determine the value of form factor for the rectangular section if the depth of is 500mm.
Q.NO.	**PART-B (FIVE MARKS QUESTIONS)**
1	Write down the different types of defects which occurs in timber?
2	Define grading of timber & what are the different grading of timber?
3	If the permissible stress in bending and compression parallel to the grains of a standard timber for inside location are 18.2 Mpa and 12 Mpa respectively. Determine the corresponding stresses for the timber of select timber and common timber.
4	A sal wood (M.P) column is (150×200) mm. Determine the safe axial load of column if the unsupported length of column is 3m.
Q.NO.	**PART-B (10 MARKS QUESTIONS)**

1	If 4 planks (160×40) mm are to be form of a box column. Find out the maximum load for mango timber used inside location. The unsupported length of timber is 3.5m.
2	A built up sal wood column consists of solid core 150×150 mm & 4 plank 200×50 mm. The effective length of column is 3.2m. Determine the safe axial load in inside location.
3	A solid column has to carry an axial load of 450 KN. If the unsupported length is 2.5m. Design a solid sal wood column in wet location. Assume any other data.

DESIGN OF MASONARY & TUBULAR SRUCTURES	
Q.NO.	**PART-A (TWO MARKS QUESTIONS)**
1	Define slenderness ratio of masonry wall.
2	For what type of structure tubular steel sections are suitable?
3	What will be the location of critical section of bending moment for RC wall and masonry wall?
4	Why tubular steel sections are normally preferred in compression member?
5	What is the allowable compressive stress in brick masonry?
6	Define cavity wall.
7	What is effective length of brick wall when the wall is continuous?
8	Define masonry unit.
9	What meant by lateral support?
10	Define curtain wall.
11	Write down the different types of load bearing wall.
12	How will you calculating effective length, effective height and effective thickness?
13	Write down the different types of grade of mortar.
Q.NO.	**PART-B (FIVE MARKS QUESTIONS)**
1	Write down the codal provision of design consideration of masonry wall under eccentricity footing.
2	Write down the codal provision of design consideration of masonry wall footing.
3	What do you mean by crinkling in tubular steel compression member?
4	Write down the minimum thickness requirement of tubular structure for different condition.