INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad-500043

CIVIL ENGINEERING

TUTORIAL QUESTION BANK

Course Title	**DESIGN OF STEEL STRUCTURES AND DRAWING**				
Course Code	ACE012				
Programme	B. Tech				
Semester	VII				
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	-	-
Chief Coordinator	Dr. Venu M, Professor				
Course Faculty	Dr. Vamsi Mohan U, Professor				

COURSE OBJECTIVES:

The course should enable the students to:	
I	Discuss the concepts of structural steel design conforming to the IS 800 design code**.**
II	Identify various types of structural steel and its properties also define concepts of Limit State Design.
III	Analyze structures using plastic method of analysis and evaluate collapse load and plastic moment capacity.
IV	Design compression members, beams, connections and girders.

COURSE OUTCOMES (COs):

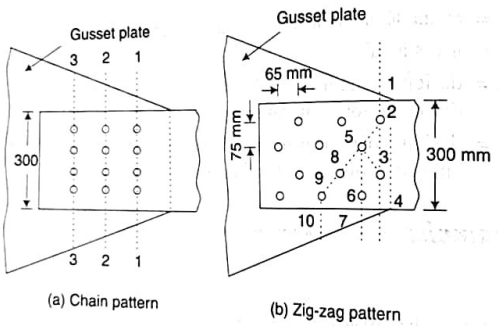
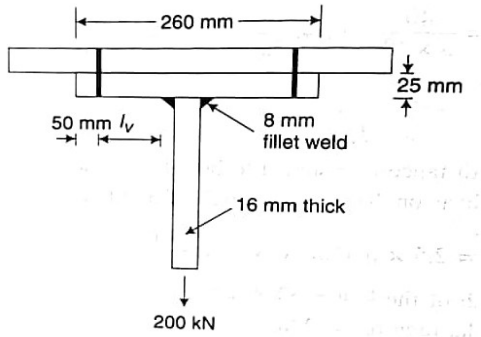
CO 1	Know the materials, making of iron and steel, types of structural steel, mechanical properties of steel, concepts of plasticity yield strength, loads and combinations loading wind loads on roof trusses, behavior of steel, local buckling. Concept of limit state design – different limit states as per IS 800:2007. Design strengths deflection limits, serviceability, bolted connections, welded connections, efficiency of joint, prying action types of welded joints, design of tension members, design strength of members.
CO 2	Know the design of compression members, buckling class, slenderness ratio, strength design, laced battened columns, column splice, column base, slab base.
CO 3	Know the design of beams, plastic moment, and bending and shear strength laterally supported beams. Design, built up sections, large plates web buckling, crippling and deflection of beams, design of purlin.
CO 4	Know the design of eccentric connections with brackets, beam end connections, web angle, unstiffened and stiffened seated connections (bolted and welded types) and design of truss joints.
CO 5	Know the design of welded plate girders, optimum depth, design of main section, design of end bearing stiffness and intermediate stiffness. Connection between web and flange and design of flange splice and web splices.

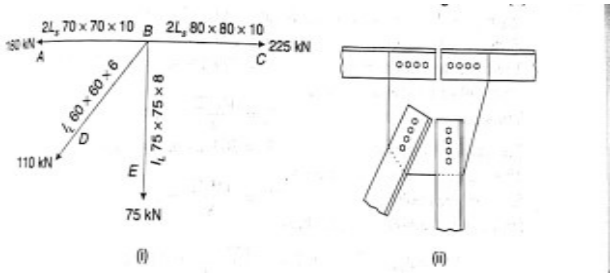
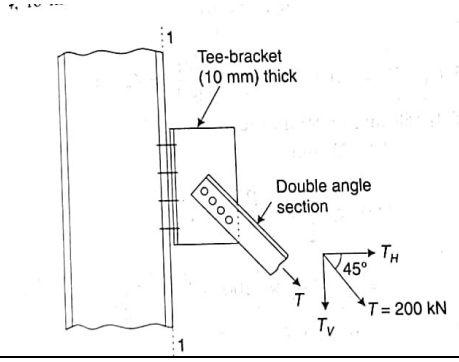
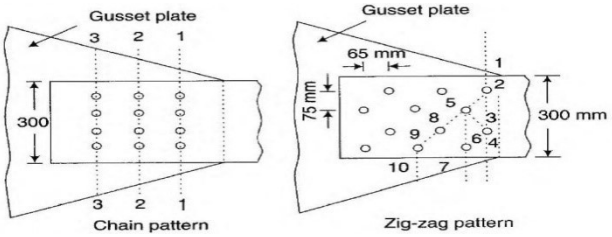
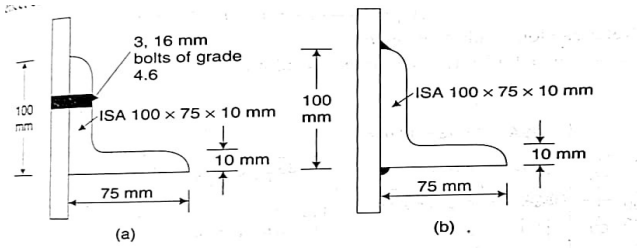
COURSE LEARNING OUTCOMES (CLOs):

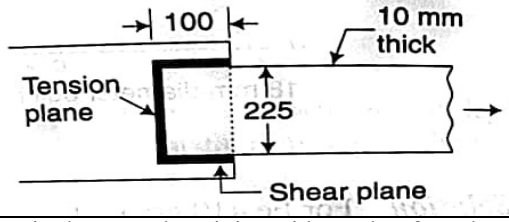
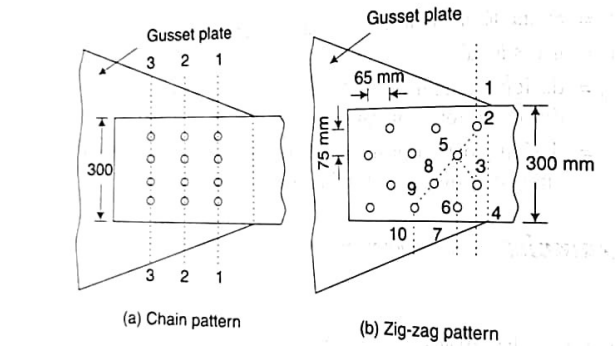
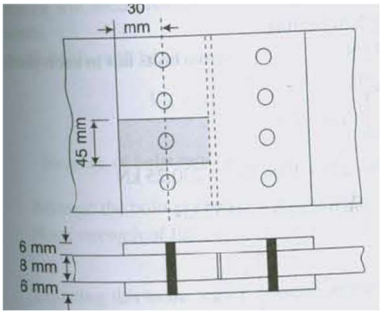
ACE012.01	Know the materials, making of iron and steel.
ACE012.02	Know the types of structural steel, mechanical properties of steel.
ACE012.03	Know the concepts of plasticity yield strength.
ACE012.04	Understand loads and combinations loading wind loads on roof trusses.
ACE012.05	Understand behavior of steel, local buckling.
ACE012.06	Concept of limit state design – different limit states as per IS 800:2007.
ACE012.07	Concept of design strengths deflection limits, serviceability.
ACE012.08	Evaluate the bolted connections.
ACE012.09	Evaluate welded connections, efficiency of joint.
ACE012.10	Analyze the prying action types of welded joints.
ACE012.11	Understand the design of tension members and design strength of members.
ACE012.12	Understand the design of compression members, buckling class, slenderness ratio.
ACE012.13	Understand the strength design, laced battened columns.
ACE012.14	Understand the design of column splice, column base, and slab base.
ACE012.15	Understand the design of beams, plastic moment.
ACE012.16	Analyse the bending and shear strength laterally supported beams.
ACE012.17	Understand the design, built up sections, large plates web buckling.
ACE012.18	Analyse the crippling and deflection of beams, design of purlin.
ACE012.19	Understand the design of eccentric connections with brackets.
ACE012.20	Analyse the beam end connections, web angle, unstiffened and stiffened seated connections, and design of truss joints.
ACE012.21	Understand the design of welded plate girders, optimum depth, and design of main section.
ACE012.22	Understand the design of end bearing stiffness and intermediate stiffness.
ACE012.23	Analyze the Connection between web and flange and design of flange splice and web splices.

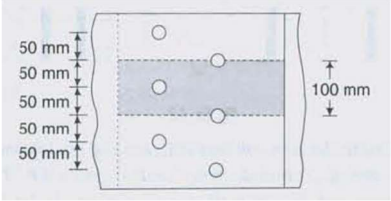
TUTORIAL QUESTION BANK

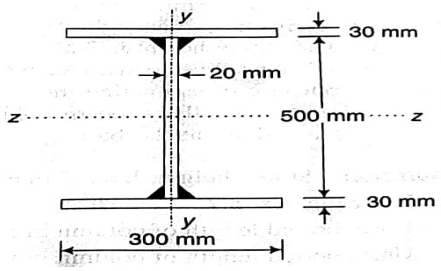
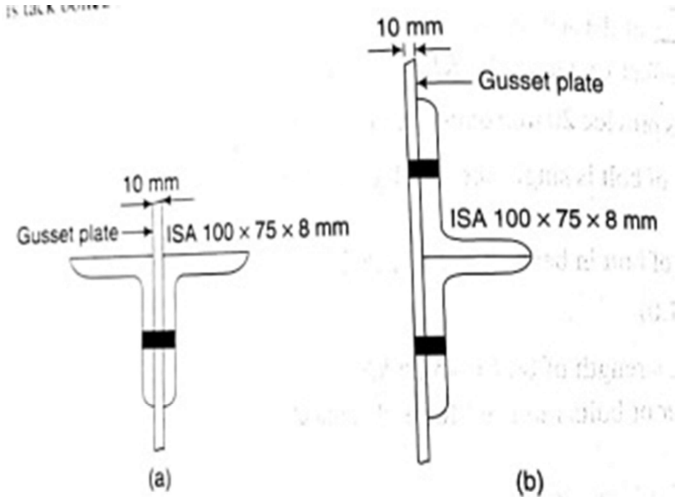
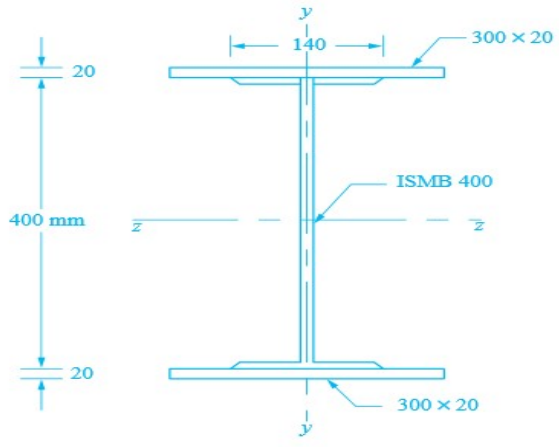
	UNIT- I			
	INTRODUCTION ON MECHANICAL BEHAVIOUR OF STEEL			
	Part - A (Short Answer Questions)			
S. No.	**QUESTIONS**	**Blooms Taxonomy Level**	**Course Outcomes**	**Course Learning Outcomes (CLOs)**
1	What are the advantages and disadvantages of steel as a structural material?	Remember	CO 1	ACE012.01
2	State the physical and mechanical properties of steel as a structural material.	Understand	CO 1	ACE012.01
3	What loads and forces are considered for designing a structure or member?	Remember	CO 1	ACE012.02
4	Why is it necessary to follow codes of practice for designing structures?	Remember	CO 1	ACE012.03
5	Write a short note on geometric properties for steel member?	Remember	CO 1	ACE012.02
6	Write a short note on weld and welding's?	Remember	CO 1	ACE012.04
7	What is fire resistance level?	Remember	CO 1	ACE012.05
8	Write a note on Ductility?	Remember	CO 1	ACE012.05
9	Explain the procedure for design strength due to block shear.	Remember	CO 1	ACE012.06

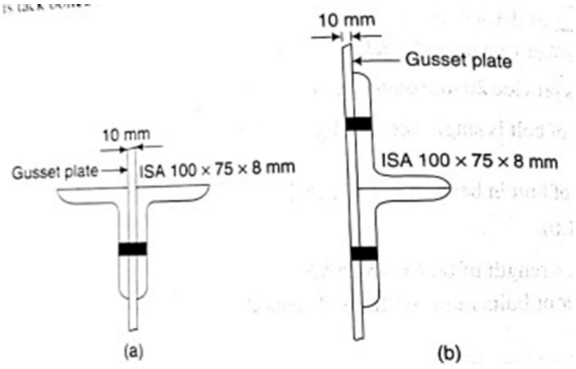
10	Write a note on limit state of serviceability?	Remember	CO 1	ACE012.07
11	Name and sketch some of the hot-rolled steel sections used in practice.	Remember	CO 1	ACE012.08
12	What are the possible limit states that are considered in the limit state method?	Remember	CO 1	ACE012.08
13	Why fillet welds are preferred compared to butt welds?	Understand	CO 1	ACE012.09
14	Briefly explain the various structural stability checks considered by the IS code.	Understand	CO 1	ACE012.10
15	What are factors governing the ultimate strength	Remember	CO 1	ACE012.10
16	What are the advantages of the bolted connections over riveted connections?	Understand	CO 1	ACE012.11
17	What are the various types of connections used for connecting the structural members?	Understand	CO 1	ACE012.11
18	What is meant by gauge distance and edge distance?	Remember	CO 1	ACE012.10
19	What is meant by compressive stress?	Understand	CO 1	ACE012.11
20	What are the methods employed for the design of the steel framework?	Remember	CO 1	ACE012.11
	Part - B (Long Answer Questions)			
1	What a short note on factors governing the ultimate strength?	Understand	CO 1	ACE012.01
2	Design a single cover butt joint with grade of steel Fe410 and grade of bolt 4.6 diameter 20mm to resist a factored load of 70 KN thickness of main plate is 10mm and butt plate is 8mm.	Analyze	CO 1	ACE012.08
3	Design a double cover butt joint with grade of steel Fe410 and grade of bolt 4.6 diameter 20mm to resist a factored load of 70 KN thickness of main plate is 10mm and butt plate is 8mm.	Analyze	CO 1	ACE012.09
4	Design a lap joint with grade of steel Fe410 and grade of bolt 4.6 diameter 20mm to resist a factored load of 70 KN thickness of plate 10mm.	Analyze	CO 1	ACE012.11
5	A 300 ISF 8mm of grade Fe410 is used as a tension member in a lattice girde It is connected to a 12mm thick gusset plate by 18mm diameter bolts of grad 4.6 calculate the effective net area of the member if (a) Chain Bolting is done as shown in figure (b) Zigzag Bolting is done as shown in figure 	Analyze	CO 1	ACE012.09
6	Check the adequacy of the hanger connection shown in figure the end plate welded connection shown in figure need not be designed. The end distance of the bolts is 50mm two bolts of 30mm diameter are used to make the connection the end plate is 260X150 mm in size if the connation is found in adequate suggest a way to make it safe 	Analyze	CO 1	ACE012.09
7	Design joint B of a roof truss as shown in figure the members are connected with 16mm diameter bolts of grade 4.6 to the gusset plate 12mm thick.	Analyze	CO 1	ACE012.09

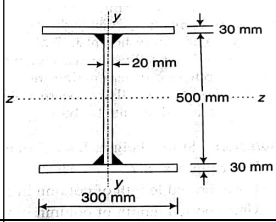
				
8	Determine whether the joint shown in figure is safe or not 8-16mm diameter bolts of grade 4.6 have been used for making the connection at section 1-1 neglect the effect of prying action. Also , find the number of 16mm diameter bolts of grade 4.6 to connect the double angle section 8mm thick each member with the web of the Tee-bracket 	Analyze	CO 1	ACE012.11
9	A 300 ISF 8mm of grade Fe410 is used as a tension member in a lattice girder. It is connected to a 12mm thick gusset plate by 18mm diameter bolts of grade 4.6 calculate the effective net area of the member if (a) Chain Bolting is done as shown in figure (b) Zigzag Bolting is done as shown in figure 	Analyze	CO 1	ACE012.11
10	Determine the effective net area of the section shown in figure. The angles are connected as shown in the figure the steel is of grade Fe410. The bolts holes have been punched. 	Analyze	CO 1	ACE012.11
11	Determine the block shear strength of the welded tension member shown in figure steel is of grade Fe410	Understand	CO 1	ACE012.11

				
12	Design a single cover butt joint with grade of steel Fe410 and grade of bolt 4.6 diameter 16mm to resist a factored load of 150 KN thickness of main plate is 16 mm and butt plate is 8mm.	Analyze	CO 1	ACE012.09
13	Design a double cover butt joint with grade of steel Fe410 and grade of bolt 4.6 diameter 16mm to resist a factored load of 150 KN thickness of main plate is 20mm and butt plate is 8mm.	Analyze	CO 1	ACE012.08
14	Design a lap joint with grade of steel Fe410 and grade of bolt 4.6 diameter 16mm to resist a factored load of 140 KN thickness of plate 10mm.	Analyze	CO 1	ACE012.09
15	What are the advantages of high strength friction grip bolts?	Understand	CO 1	ACE012.09
16	Explain the different types of failures in bolted joints with figures?	Understand	CO 1	ACE012.11
	Part - C (Problem Solving and Critical Thinking Questions)			
1	Design a single cover butt joint with grade of steel Fe410 and grade of bolt 4.6 diameter 20mm to resist a factored load of 170 KN thickness of main plate is 16 mm and butt plate is 8mm.	Analyze	CO 1	ACE012.11
2	Design a double cover butt joint with grade of steel Fe410 and grade of bolt 4.6 diameter 20mm to resist a factored load of 120 KN thickness of main plate is 20mm and butt plate is 8mm.	Analyze	CO 1	ACE012.11
3	Design a lap joint with grade of steel Fe410 and grade of bolt 4.6 diameter 20mm to resist a factored load of 100 KN thickness of plate 10mm.	Analyze	CO 1	ACE012.09
4	A 300 ISF 8mm of grade Fe410 is used as a tension member in a lattice girde It is connected to a 10mm thick gusset plate by 16mm diameter bolts of grad 4.6 calculate the effective net area of the member if (a) Chain Bolting is done as shown in figure (b) Zigzag Bolting is done as shown in figure 	Analyze	CO 1	ACE012.08
5	A single bolted double cover butt joint is used to connect two plates which are 8mm thick. Assuming 16mm diameter bolts of grade 4.6 and cover plates to be 6mm thick, calculate the strength and efficiency of the joint if 4 bolts are provided in the bolt line at a pitch of 45mm as shown in below figure. 	Analyze	CO 1	ACE012.08
6	Determine the strength and efficiency of the lap joint shown in figure. The	Analyze	CO 1	ACE012.09

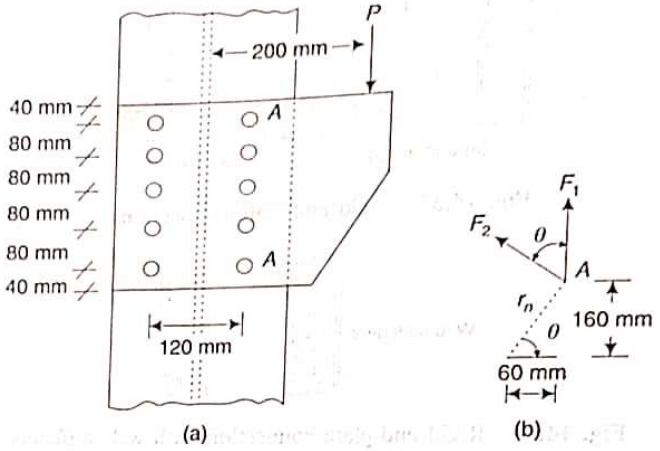
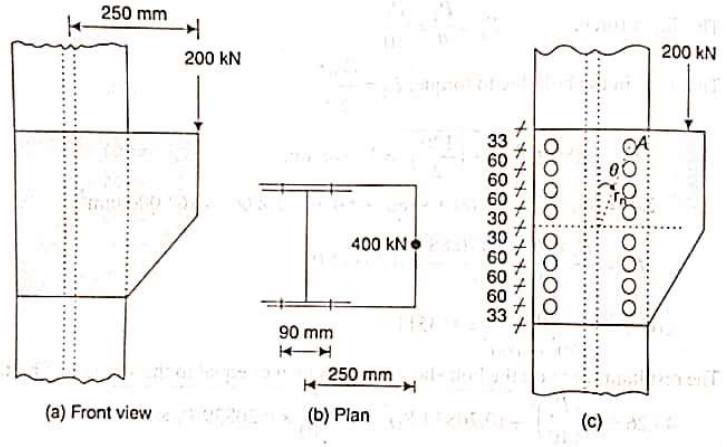
	bolts are of 20mm diameter and of grade 4.6. The two plates to be jointed are 10mm and 12mm thick (steel is of grade Fe410).  			
7	Two flats (Fe410 grade steel), each 210mmX8mm, are to be jointed 20mm diameter, 4.6 grade bolts, to form a lap joint. The joint is supported to transfer a factored load of 250kN. Design the joint and determine the suitable pitch for the bolts.	Analyze	CO 1	ACE012.11
8	Two ISF sections 200mmX10mm each and 1.5 m long are to be jointed to make a member length of 3m. Design a butt joint with the bolts arranged in the diamond pattern. The flats are supposed to carry a factored tensile force of 450kN. Steel is of grade Fe410. 20mm diameter bolts of grade 4.6 are used to make the connections. Also determine the net tensile strength of the main plate and cover plate.	Analyze	CO 1	ACE012.11
	UNIT-II			
	COMPRESSION MEMBERS			
	Part – A (Short Answer Questions)			
1	What is buckling?	Remember	CO 2	ACE012.12
2	Write a note on eccentric beam connections?	Remember	CO 2	ACE012.12
3	What is radius of gyration?	Remember	CO 2	ACE012.12
4	What is slenderness ratio? State the relation between elastic critical stress and slenderness ratio.	Remember	CO 2	ACE012.13
5	What are semi-compact sections?	Remember	CO 2	ACE012.12
6	What is slenderness ratio?	Remember	CO 2	ACE012.14
7	What is stability limit state?	Remember	CO 2	ACE012.13
8	What are the causes of leading imposed load?	Remember	CO 2	ACE012.12
9	How to calculate non-dimensional effective slenderness ratio?	Remember	CO 2	ACE012.14
10	Write the formula to calculate design compression stress?	Remember	CO 2	ACE012.13
11	What is meant by strut?	Remember	CO 2	ACE012.14
12	What are the assumptions made in Euler's analysis?	Remember	CO 2	ACE012.12
13	What is meant by effective sectional area?	Remember	CO 2	ACE012.12
14	What are the buckled modes for different end conditions?	Remember	CO 2	ACE012.13
15	What is meant by built-up compression members?	Remember	CO 2	ACE012.12
16	Define position restraint.	Remember	CO 2	ACE012.12
17	How the effective length of column is determined?	Remember	CO 2	ACE012.14
18	What are the forces acting on lacing system?	Remember	CO 2	ACE012.12
19	What are the types of bases provided fro connecting the column to the base?	Remember	CO 2	ACE012.12
20	What is the purpose for providing anchors bolt in base plate?	Remember	CO 2	ACE012.14
	Part - B (Long Answer Questions)			
1	Calculate the value of the least radius of gyration for a compound column consisting of ISHB 250@ 536.6 N/m. with one cover plate 300X20mm on each flange.	Analyze	CO 2	ACE012.13
2	Calculate the design compressive load for a stanchion 350@710.2N/m high the column is restrained in direction and position at both the ends it is to be used as an uncased column in single storey building use steel grade of Fe410	Analyze	CO 2	ACE012.14
3	Design a column to support a factored load of 1050 kN. The column has an effective length of 7.0m with respect to Z axis and 5.0 m with respect to Y axis. Use steel grade of Fe410.	Analyze	CO 2	ACE012.14
4	Design a stanchion 3.5m long in a building subjected to a factored load of 550kN. Both the ends of stanchion are effectively restrain in direction and position. Use steel grade of Fe410.	Analyze	CO 2	ACE012.13
5	For a column section built up of shape as shown in figure. Determine the axial load capacity in compression for the data indicated against the figure. f_y = 250 Mpa	Analyze	CO 2	ACE012.14

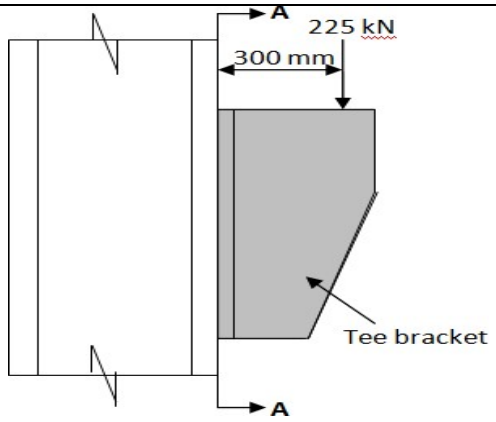
	L= 6.0m t_w = 20mm t_f = 30mm partial safety factor = 1.50 			
6	Design a single angle discontinues strut to carry a factored axial compressive load of 65kN. The length of the strut is 3.0m between intersections. It is connected to 12mm thick gusset plate by 20mm diameter 4.6 grade bolts. Use steel grade of Fe410.	Analyze	CO 2	ACE012.13
7	Calculate the strength of a discontinuous strut of length 3.2m. the strut consist of 2 unequal angles 100mm x 75mm x 8mm (f_y = 250N/mm2) with long legs connected and placed. a) On the opposite side of the gusset plate. b) On the same side of the gusset plate. 	Analyze	CO 2	ACE012.14
8	Why is it better to choose plastic or compact sections for columns?	Understand	CO 2	ACE012.14
9	Determine the load carrying capacity of the column section shown in figure, if its actual length is 4.5m. It's one end may be assumed fixed and the other end hinged. The grade of steel is Fe410 	Analyze	CO 2	ACE012.13

10	Design a laced column with two channels back to back of length 10m to carry an axial factored load of 1400KN. The column may be assumed to have restrained in position but not in direction at both ends(hinged ends)	Analyze	CO 2	ACE012.12
11	Design a battened column with two channels back to back of length 10m to carry an axial factored load of 1400KN. The column may be assumed to have restrained in position but not in direction at both ends(hinged ends)	Understand	CO2	ACE012.13
	Part - C (Problem Solving and Critical Thinking Questions)			
1	Design a double angle discontinuous strut to carry a factored load of 135 KN, resulting from combination from wind load. The length of the strut is 3.0m between intersections. The two angles are placed back-to-back (with long legs connected) and are tack bolts. Use grade of steel Fe410. (a) Angles are placed on opposite sides of 10mm gusset plate. (b) Angles are placed on same sides of 10mm gusset plate. 	Analyze	CO 2	ACE012.13
2	Design a built-up column 10 m long to carry a factored axial load of 1080 Kn. The column is restrained in position but not in direction at both the ends. Provide single lacing system with bolted connection. Assume steel of grade Fe410and bolts of grade 4.6.Design the column with two channels placed back-to-back	Analyze	CO 2	ACE012.14
3	Design a built-up column 10 m long to carry a factored axial load of 1080 Kn. The column is restrained in position but not in direction at both the ends. Provide single lacing system with bolted connection. Assume steel of grade Fe410and bolts of grade 4.6.Design the column with two channels placed toe-to-toe.	Analyze	CO 2	ACE012.14
4	Design a built up column 9 m long to carry a factored axial compressive load of 1100Kn. The column is restrained in position but not in direction at both the ends. Design the column with connecting system as battens with bolted connections. Use two channel sections back-to-back. Use steel of grade Fe410.	Understand	CO 2	ACE012.12
5	A column ISHB 300 @ 576.8 N/m is to support a factored load of 900KN.the column section is to be spliced at a height of 2.5 m > design the splice plate and connections using 4.6 grade bolts. Use steel of grade De410.	Analyze	CO 2	ACE012.13
6	A stanchion ISHB 300 @ 618 N/m in the lower story of a building is to be jointed to a stanchion ISHB 200 @ 392.4 N/m of the next upper storey. A load of 600 KN is to be transferred from the top storey stanchion. Design the column splice. The column ends are made flush. Use steel of grade Fe4110 and bolts of grade 4.6	Analyze	CO 2	ACE012.13
7	In a truss a strut 3m long consists of two angles ISA 100100, 6mm.find the factored strength of the member if the angles are connected on both sides of 12mm gusset plate by i) One bolt ii) Two bolt	Analyze	CO 2	ACE012.12
8	A column am long has to support a factored load of 6000kN.the column is effectively held at both and restrained in direction at one of the ends. Design	Analyze	CO 2	ACE012.14

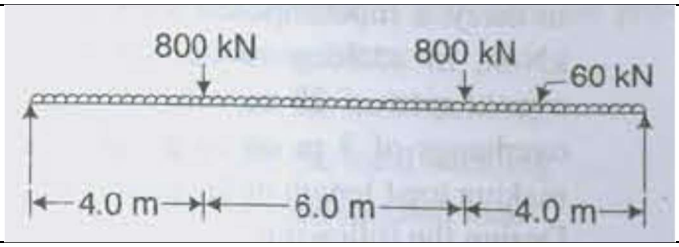
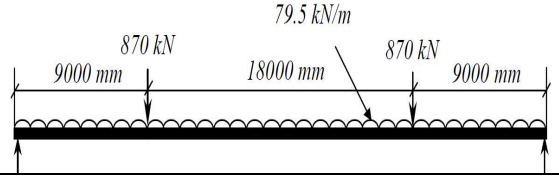
	the column using beam section and plates.			
9	Design a single angle strut connected to the gusset plate to carry 180kN factored load. The length of the strut between centre to centre intersections is 3m.	Analyze	CO 2	ACE012.13
10	Design a laced column with two channels back to back of length 10m to carry an axial factored load of 1400kN.the column may be assumed to have restrained in position but not in direction at both ends.	Analyze	CO 2	ACE012.14
	UNIT –III			
	BEAMS			
	Part - A (Short Answer Questions)			
1	Why are rolled I-sections widely used as beam members?	Remember	CO 3	ACE012.15
2	Differentiate between the bending and buckling of a beam.	Remember	CO 3	ACE012.15
3	How does buckling of column and beam differ?	Understand	CO 3	ACE012.16
4	Why should plastic or compact section be preferred for flexural members in limit state design method?	Remember	CO 3	ACE012.17
5	What are checks to be performed to design a beam member?	Remember	CO 3	ACE012.16
6	What is meant by limit state design?	Remember	CO 3	ACE012.18
7	What is meant by slenderness sections?	Remember	CO 3	ACE012.15
8	Write Short notes on compact sections?	Remember	CO 3	ACE012.16
9	List the various factors affecting the lateral-torsional buckling strength	Remember	CO 3	ACE012.17
10	What are the classifications in Stiffeners?	Remember	CO 3	ACE012.18
11	What is effective span of a beam?	Understand	CO 3	ACE012.18
12	Define lateral stability of beam.	Understand	CO 3	ACE012.15
13	Define elastic critical moment.	Remember	CO 3	ACE012.16
14	Under what conditions can a beam member be assumed as laterally restrained.	Understand	CO 3	ACE012.18
15	What is local buckling of a beam member?	Understand	CO 3	ACE012.17
16	Write Short notes on Purlin	Remember	CO 3	ACE012.15
17	Write the Special features of limit state design method	Remember	CO 3	ACE012.18
18	What is meant by laterally supported beam	Remember	CO 3	ACE012.16
19	What is meant by plastic method of design?	Remember	CO 3	ACE012.18
20	Define shape factor.	Remember	CO 3	ACE012.15
	Part – B (Long Answer Questions)			
1	An I section beam is fabricated with plates of following dimensions as shown in figure classify flanges, web and the section. Also determine the plastic moment capacity of the beam about its strong axis, if the grade of steel is Fe410. 	Analyze	CO 3	ACE012.15
2	Determine the design bending strength of ISLB 350 @ 486 N/m considering the beam to be laterally supported. The design shear force V is less than the design shear strength. The unsupported lengthy of the beam is 3.0 M assume steel of grade Fe410.	Analyze	CO 3	ACE012.16
3	Determine the design bending strength of ISLB 350 @ 486 N/m considering the beam to be laterally unsupported. The design shear force V is less than the design shear strength. The unsupported lengthy of the beam is 3.0 M assume steel of grade Fe410.	Analyze	CO 3	ACE012.18
4	A simply supported steel joist of 4.0 m effective span is laterally supported throughout. It carries a total uniformly distributed load of 40 KN. Design a appropriate section using steel of grade Fe410.	Analyze	CO 3	ACE012.17
5	A simply supported steel joist of 4.0 m effective span is laterally supported throughout. It carries a total uniformly distributed load of 80 KN. Design a appropriate section using steel of grade Fe410.	Analyze	CO 3	ACE012.16

6	Design a laterally supported beam of effective span 6 m for the following Grade of steel Fe410 Maximum bending Moment M= 150KNm Maximum shear force V= 210KN Check for deflection is not required.	Understand	CO 3	ACE012.15
7	Design a laterally unsupported beam for the following data Effective span 6 m Grade of steel Fe410 Maximum bending Moment M= 550KNm Maximum shear force V= 200KN Check for deflection is not required.	Analyze	CO 3	ACE012.16
8	Design a steel beam section for supporting roof of a big hall for the following data and apply the usual checks. Assume steel of grade Fe410. Clear span 6.5 m End bearing 150 mm c/c spacing of beams 3 m Imposed load on beam 10 KN/m^3 Dead load 4 KN/m^3 Restriction on the beam depth 375mm The compression flange of the beam is laterally supported throughout.	Analyze	CO 3	ACE012.18
9	Design a bearing plate at the support for a roof beam ISMB 600 @ 1202.71 N/m resting on a concrete predestine masonry wall 250 mm thick for the following data Reaction 200 KN Grade of concrete M20	Analyze	CO 3	ACE012.17
10	A simply supported steel joist with a 4.0 m effective span carries a uniformly distributed load of 50 KN over its span inclusive of its self weight. The beam is supported laterally throughout. Design the beam. Use steel of grade Fe410.	Analyze	CO 3	ACE012.15
	Part – C (Problem Solving and Critical Thinking)			
1	Determine the design bending strength of ISLB 350 @ 486 N/m considering the beam to be laterally unsupported. The design shear force V is less than the design shear strength. The unsupported lengthy of the beam is 6.0 M assume steel of grade Fe410.	Analyze	CO 3	ACE012.15
2	A simply supported steel joist of 6.0 m effective span is laterally supported throughout. It carries a total uniformly distributed load of 40 KN. Design a appropriate section using steel of grade Fe410.	Analyze	CO 3	ACE012.18
3	Design a laterally supported beam of effective span 5 m for the following Grade of steel Fe410 Maximum bending Moment M= 100KNm Maximum shear force V= 150KN Check for deflection is not required.	Analyze	CO 3	ACE012.17
4	Design a laterally unsupported beam for the following data Effective span 5 m Grade of steel Fe410 Maximum bending Moment M= 450KNm Maximum shear force V= 250KN Check for deflection is not required.	Analyze	CO 3	ACE012.16
5	A simply supported steel joist with a 5.0 m effective span carries a uniformly distributed load of 40 KN over its span inclusive of its self-weight. The beam is supported laterally throughout. Design the beam. Use steel of grade Fe410.	Analyze	CO 3	ACE012.15
	UNIT –IV			
	ECCENTRIC CONNECTIONS			
	Part – A (Short Answer Questions)			
1	What is the meaning of eccentricity in loading?	Remember	CO 4	ACE012.19
2	What are Eccentric connections?	Remember	CO 4	ACE012.19
3	What is bolted framed connections?	Remember	CO 4	ACE012.20
4	What is stiffened seat connection?	Remember	CO 4	ACE012.19
5	When the seated beam connections are preferred and name the types?	Understand	CO 4	ACE012.20
6	What is bolted bracket connections?	Remember	CO 4	ACE012.19
7	What are welded framed connections?	Understand	CO 4	ACE012.20
8	Define light moment connections.	Understand	CO 4	ACE012.20
9	Define heavy moment connections.	Understand	CO 4	ACE012.20
10	What are split beam connections?	Understand	CO 4	ACE012.19
	Part – B (Long Answer Questions)19			

1	Draw the typical sketch to show the following beam column connection: (a) stiffened seated connection (b) unstiffened seated connection	Understand	CO 4	ACE012.19
2	Determine the safeload P that can be carried by the joint shown in figure the bolts use are 20mm diameter of grade 4.6 the thickness of the flange of I section is 9.1mm and that of bracket plate 10mm. 	Understand	CO 4	ACE012.19
3	Explain the design procedure for unstiffened seat connection.	Understand	CO 4	ACE012.20
4	Design a bolted bracket connection to support an end reaction of 400KN because of the factored loads supported by the beam. The eccentricity of the end reaction is as shown in figure the steel used is of grade Fe410 use bolts of grade 4.6. The thickness of bracket plate may be taken as 10mm the column section is ISHB 150@300.19N/m. 	Understand	CO 4	ACE012.20
5	Design a bracket connection to transfer an end reaction of 225 kN due to factored loads as in Figure below. The end reaction from the girder acts at an eccentricity of 300 mm from the face of the column flange. Design bolted joint connecting the Tee-flange with the column flange. Steel is of grade Fe 410 and bolts of grade 4.6.	Understand	CO 4	ACE012.19

				
6	Design a stiffened seat connection for an ISMB 350@ 514 N/m transmitting an end reactionof320kN(due to factored loads) to a column section ISHB 300 @ 576.8N/m. The steel is of grade Fe 410 and bolts of grade 4.6	Analyze	CO 4	ACE012.20
7	In a framed connection an ISLB 350 @ 485.6 N/m transmits an end reaction of 220 KN and moment of 22 KN/m. under factored loads to a column ISHB 300 @ 576.8 N/m Design the connection.	Analyze	CO 4	ACE012.20
8	A beam ISLB 400 @ 558.19 N/m transmits an end reaction of 230 KN. Due to factored loads to the flanges of a column ISHB 200 @392.4 N/m design the end plate connection using 20 mm diameter bolts of grade 4.6 steel of grade Fe410.	Analyze	CO 4	ACE012.19
9	An ISMB 500 @ 852.5 N/m transmits an end reaction of 300 KN. And bending moment of 150 KNm under factored loads to the flange of a column ISHB 300 @576.8 N/m design welded connection.	Analyze	CO 4	ACE012.19
10	A bracket plate is welded to the flange of a column section ISHB 300 @ 618 N/m as shown in figure calculate the size of the weld required to support a factored load of 110 KN Assume shop welding.	Analyze	CO 4	ACE012.20
	Part – C (Problem Solving and Critical Thinking)			
1	Design a stiffened seat connection for an ISMB 300@ 514 N/m transmitting an end reaction of 300kN (due to factored loads) to a column section ISHB 250 @ 576.8N/m. The steel is of grade Fe 410 and bolts of grade 4.6.	Analyze	CO 4	ACE012.19
2	In a framed connection an ISLB 350 @ 485.6 N/m transmits an end reaction of 200 KN and moment of 20 KN/m. under factored loads to a column ISHB 300 @ 576.8 N/m Design the connection.	Analyze	CO 4	ACE012.20
3	A beam ISLB 400 @ 558.19 N/m transmits an end reaction of 300 KN. Due to factored loads to the flanges of a column ISHB 200 @392.4 N/m design the end plate connection using 20 mm diameter bolts of grade 4.6 steel of grade Fe410.	Analyze	CO 4	ACE012.20
4	An ISMB 500 @ 852.5 N/m transmits an end reaction of 250 KN. And bending moment of 150 KNm under factored loads to the flange of a column ISHB 300 @576.8 N/m design welded connection.	Analyze	CO 4	ACE012.19
5	A bracket plate is welded to the flange of a column section ISHB 300 @ 618 N/m as shown in figure calculate the size of the weld required to support a factored load of 100 KN Assume shop welding.	Analyze	CO 4	ACE012.19
	UNIT -V			
	WELDED PLATE GIRDERS			
	Part - A (Short Answer Questions)			
1	What is a plate girder? Where it is used? Explain its components with neat sketches.	Remember	CO 5	ACE012.21
2	Derive the expression for the economical depth of a plate girder. Assume moment resisted by flanges only.	Remember	CO 5	ACE012.22
3	Explain the tension field action of thin web plates.	Remember	CO 5	ACE012.21
4	What different stiffeners used in plate girders and specify the importance of those stiffeners.	Remember	CO 5	ACE012.23
5	Explain about bearing stiffeners with neat sketches.	Remember	CO 5	ACE012.22
6	What is the minimum web thickness based on serviceability criterion?	Remember	CO 5	ACE012.21
7	What is the minimum web thickness based on compression flange buckling	Remember	CO 5	ACE012.22

	criterion?			
8	Explain about shear buckling design methods.	Remember	CO 5	ACE012.23
9	Explain post buckling behavior of web plate.	Remember	CO 5	ACE012.22
10	Explain collapse behavior of web plate.	Remember	CO 5	ACE012.22
11	List the various factors affecting the lateral-torsional buckling strength	Remember	CO 5	ACE012.21
12	How do you improve the shear resistance in plate girder.	Remember	CO 5	ACE012.21
13	What are the classifications in Stiffeners?	Remember	CO 5	ACE012.23
14	Under what circumstances web plates are stiffened and unstiffened used?	Remember	CO 5	ACE012.21
15	What is the purpose of providing stiffener in plate girder?	Remember	CO 5	ACE012.22
16	Under what circumstances load bearing stiffeners are used in plate girder?	Remember	CO 5	ACE012.22
17	Under what circumstances bearing stiffeners are used in plate girder?	Remember	CO 5	ACE012.23
18	What is the purpose of providing intermediate stiffeners?	Remember	CO 5	ACE012.21
19	What is the main function of providing horizontal stiffener in plate girder?	Remember	CO 5	ACE012.21
20	What are the reasons behind splicing in plate girder?	Remember	CO 5	ACE012.22
	Part - B (Long Answer Questions)			
1	Design a welded plate girder 24m in span and laterally restrained throughout. It has to support a uniform load of 100kN/m throughout the span exclusive of self-weight. Design the girder without intermediate transverse stiffeners. The steel for the flange and web plates is of grade Fe 410. Design the cross section, the end load bearing stiffener and connections.	Analyze	CO 5	ACE012.22
2	Design a welded plate girder 24m in span and laterally restrained throughout. It has to support a uniform load of 100kN/m throughout the span exclusive of self-weight. Design the girder with intermediate transverse stiffeners. The steel for the flange and web plates is of grade Fe 410. Connections need not be designed. Use post critical method for the design.	Analyze	CO 5	ACE012.23
3	Design a welded plate girder of 20m span using the tension field action for the factored forces. Maximum moment is 5000 kN-m; Maximum shear force is 900kN. The girder is laterally restrained. Connections need not be designed.	Analyze	CO 5	ACE012.21
4	A welded plate girder is to carry a factored moment of 5000 kN-m and a factored shear of 800kN. Suggest suitable size of flange plates.	Analyze	CO 5	ACE012.21
5	A welded plate girder has following elements. Flange plates 400X16mm one plate for each flange; web 2000X10 mm. compute the sectional properties and moment of resistance of the plate girder. Design also the load carrying and end bearing stiffeners. If the plate girder is to carry uniformly distributed load of 120kN/m.	Analyze	CO 5	ACE012.22
6	A welded plate girder has following elements. Flange plates 400X16mm one plate for each flange; web 2000X10 mm. compute the sectional properties and moment of resistance of the plate girder. Design the intermediate stiffeners. If the plate girder is to carry uniformly distributed load of 120kN/m.	Analyze	CO 5	ACE012.23
7	A plate girder is subjected to a maximum factored moment of 3000kN-m and a factored shear force of 500kN. Find the preliminary section of girder with end stiffeners.	Analyze	CO 5	ACE012.21
8	A plate girder with Fe415 steel plates is having 14 X 1400 mm web pate and 50X500mm flange plates. Determine the design strength in shear, if no intermediate stiffeners are used.	Analyze	CO 5	ACE012.21
9	A welded plate girder consists of the following elements. Flange plates 500X32 mm one plate for each flange; web 2200X8mm. The girder is subjected to a uniformly distributed load of 80kN/m. It is also subjected to a lateral load of 2kN at the mid height of the girder. Design the vertical stiffeners.	Analyze	CO 5	ACE012.22
10	Design a section of a plate girder to carry a uniformly distributed load of 1000kN over a span of 10m. A full lateral support is provided to the compression flange. Design the flange to web connections. Provide stiffeners if required.	Analyze	CO 5	ACE012.21
	Part – C (Problem Solving and Critical Thinking)			
1	Design a plate girder spanning 14 m and loaded as shown in figure. The self-weight of the plate girder may be assumed to be 60kN distributed uniformly over the entire span. Use steel of grade Fe 410.	Analyze	CO 5	ACE012.23

				
2	Design a welded plate girder of 30 m span. It is subjected to a uniformly distributed load of 32 kN/m. Design also the stiffeners and their connections.	Analyze	CO 5	ACE012.23
3	A plate girder with Fe415 steel plates is having 10 X 1500 mm web pate and 50X500mm flange plates. Determine the design strength in shear, if stiffeners are provided at every 2m intervals.	Analyze	CO 5	ACE012.23
4	Design a welded plate girder of span 24 m to carry superimposed load of 35 kN/m. avoid use of bearing and intermediate stiffeners. Use Fe415 steel.	Analyze	CO 5	ACE012.22
5	A plate girder is subjected to a maximum factored moment of 4000kN-m and a factored shear force of 600kN. Find the preliminary section of girder without any stiffeners.	Analyze	CO 5	ACE012.23
6	A plate girder with Fe415 steel plates is having 12 X 1500 mm web pate and 56X500mm flange plates. Determine the design flexural strength, if the compression flange is supported laterally.	Analyze	CO 5	ACE012.21
7	Design a simply supported plate girder of span 15m carrying a factored UDL of 48kN/m, using only end stiffeners. Assume compression flange is laterally supported.	Analyze	CO 5	ACE012.22
8	A plate girder is made with Fe415 steel plates. The web plate is of the size 1200 X12 mm and flange of size 440 X 36mm. Check the adequacy of a pair of stiffeners of size 200 X12mm.	Analyze	CO 5	ACE012.22
9	A plate girder is subjected to a maximum factored moment of 2000kN-m and a factored shear force of 400kN. Find the preliminary section of girder with end as well as intermediate transverse stiffeners.	Analyze	CO 5	ACE012.23
10	The girder showed in figure is fully restrained against lateral buckling throughout its span. The span is 36m and carries two concentraed loads 870 kN acting at 9 m from left support and 9mm fromm right support. Design the plate girder. 	Analyze	CO 5	ACE012.23

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