SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF CIVIL ENGINEERING

QUESTION BANK

VI SEMESTER

1903601 – DESIGN OF STEEL STRUCTURAL ELEMENTS

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SUBJECT CODE: 1903601

SUBJECT NAME: DESIGN OF STEEL STRUCTURAL ELEMENTS

SEM / YEAR: VI/ III

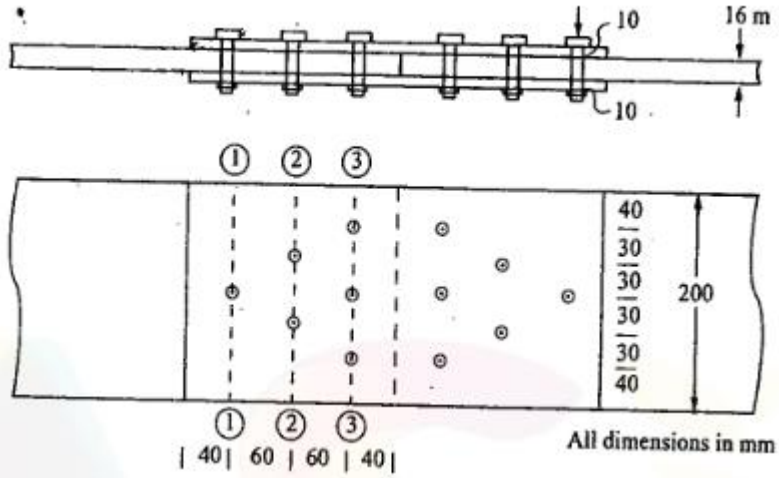
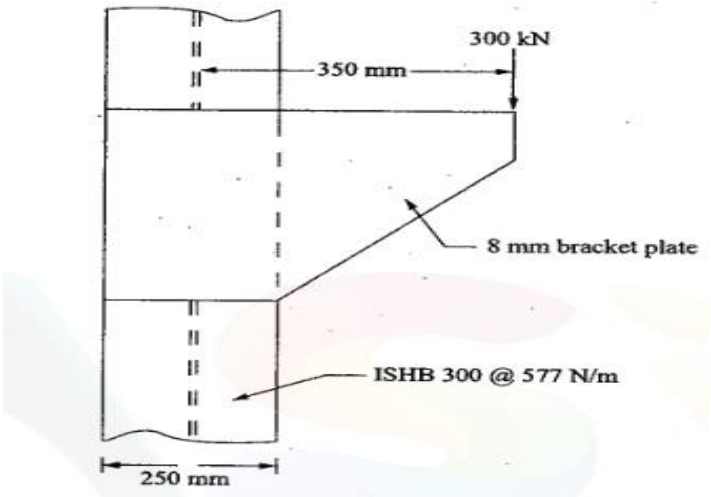
UNIT I - INTRODUCTION

Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures– Basic concepts of connection-Bolted connection: Types of bolts-modes of failures; Joints subjected to direct and eccentric load-Welded connection: Types and strength of welds Butt and fillet welds -Joints subjected to direct load and eccentric load.

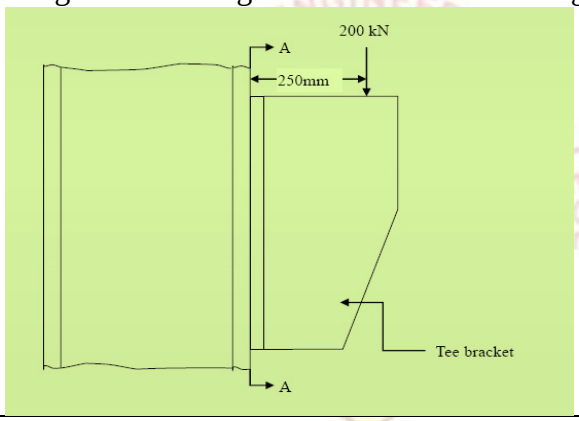
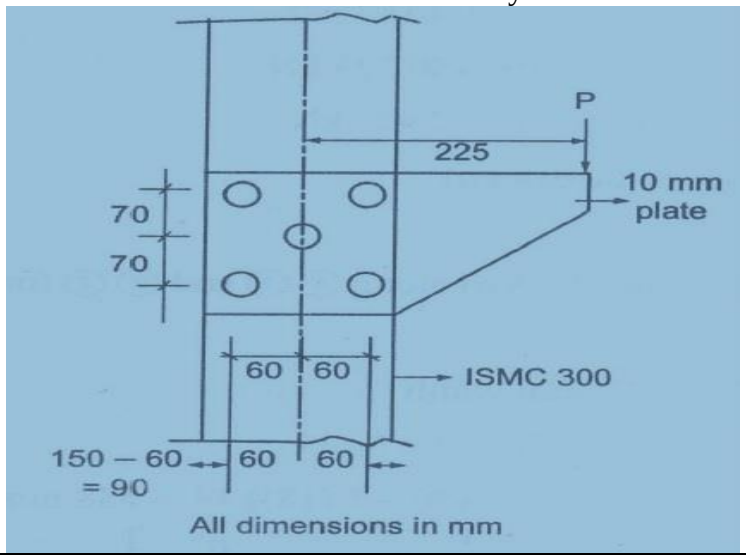
Q.NO	PART-A	BT level	Competence
1.	Define Necking of steel sections.	BT-1	Remember
2.	Write down the formula for calculate the efficiency of Bolt Joint.	BT-1	Remember
3.	Write down the equation for calculating the effective throat thickness of weld?	BT-1	Remember
4.	List the types of failures occur in bolt joint?	BT-1	Remember
5.	Discuss the advantages and disadvantages of steel structures design.	BT-2	Understand
6.	Define the term – Pitch.	BT-1	Remember
7.	Differentiate nominal diameter and gross diameter of bolt.	BT-2	Understand
8.	List the various types of welded joints	BT-1	Remember
9.	Summarize the advantages of HSFG bolts?	BT-3	Apply
10.	Define the terms edge and end distance of bolt joint.	BT-1	Remember
11.	Classify the types of bolts used for structural purposes?	BT-3	Apply
12.	List out the mechanical properties is structural steel.	BT-1	Remember
13.	Discuss the stress-Strain curve for structural steel and indicate the salient points	BT-2	Understand
14.	Summarize about splitting of plates.	BT-3	Apply
15.	Define the terms gauge, pitch of bolt joint.	BT-1	Remember
16.	Compare and contrast the high tension bolt from common black bolt?	BT-4	Analyse
17.	In what way, the design of steel sections differ with various design philosophy.	BT-1	Remember
18.	Write down the minimum pitch and maximum pitch as per IS 800-2007.	BT-1	Remember

19.	Compare the advantages of welded connection over bolted connection.	BT-2	Understand
20.	Explain the terms slip factor and prying action.	BT-4	Analyse
21.	Explain what is structural steel.	BT-2	Understand
22.	List out the important properties of structural steel.	BT-1	Remember
23.	Summarize the advantages and disadvantages of using steel structures.	BT-2	Understand
24.	List the assumption made in the design of bearing bolts.	BT-1	Remember
25.	What are the advantages and disadvantages of welded connection?	BT-1	Remember

Q.NO	PART-B	BT Level	Competence
1.	Two plates 10 mm and 20 mm thick are connected by double cover butt joint made of 8mm cover plate. Record the strength of the joint. If 6 numbers of M20 bolts of grade 4.6 and Fe 415 are used on either sides of the joint in two rows with pitch of 60mm and edge distance of 40mm in both direction.	BT-1	Remember
2.	Describe about the following a) Design philosophies for structural steel (7) b) Show the various limit states to be considered in design of steel structures (6)	BT-1	Remember
3.	Discuss about the following c) Sectional classification and properties of structural steel (7) d) Factor of safety for loads and materials (6)	BT-2	Understand
4.	Differentiate and summarize the various methods of fabrications in steel structures.	BT-2	Understand
5.	Two plates 10 mm and 8 mm thick are connected by double cover butt joint made of 8mm cover plate. Record the strength of the joint. If 4 numbers of M20 bolts of grade 4.6 and Fe 415 are used on either sides of the joint in two rows with pitch of 60mm and edge distance of 40mm in both direction.	BT-2	Understand
6.	A single bolted double cover butt joint is used to connect two plates 8mmthick.Assuming 20mm bolts at 50mm pitch examine and record the efficiency of the joint. The thickness of cover plate is 4mm.	BT-1	Remember
7.	A tie member 75 mm X 8mm is to transmit a load of 90 kN. What is the length of the fillet weld and calculate the necessary overlap.	BT-1	Remember
8.	An ISLC 300 @ 331N/m is used to transmit a force of 500KN. The channel section is connected to a gusset plate of 8mm thick. Identify the suitable fillet weld if the overlap is limited to 350mm.	BT-3	Apply

9.	A tie member of a roof truss consists of 2 ISA 90 x 60 x 10 mm is connected to a 12 mm thick gusset plate on either side and carries a factored pull of 400KN , Design suitable welded connection.	BT-4	Analyse
10.	Design a double bolted lap joint for a plate of 20mm thickness to carry its full load. a. If the bolts are bearing type b. If the bolts are friction grip type bolts	BT-4	Analyse
11.	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	BT-4	Analyse
12.	Calculate the efficiency of the lap joint shown in fig. use M20 bolts of grade 4.6 and Fe 410 plates. 	BT-3	Apply
13.	A bracket is bolted to the flange of a column as shown. Use 8 mm thick bracket plate and M20 bolts of grade 4.6, Illustrate and design the connection. 	BT-3	Apply

14.	Design a lap joint between the two plates each of width 120mm, if the thickness of one plate is 16 mm and the other is 12 mm. The joint has to transfer a design load of 160kN. The plates are of Fe 410 grade. Use bearing type plates.	BT-6	Create
15.	Explain how limit state method differs from working stress method of design.	BT-2	Understand
16.	Explain how limit state design differs from ultimate load design.	BT-2	Understand
17.	Explain the special consideration required in the design of steel structures.	BT-2	Understand

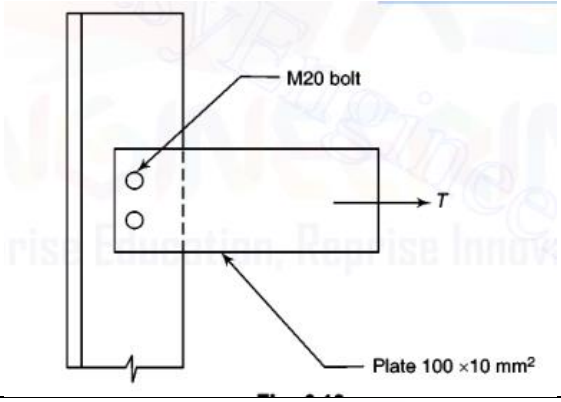
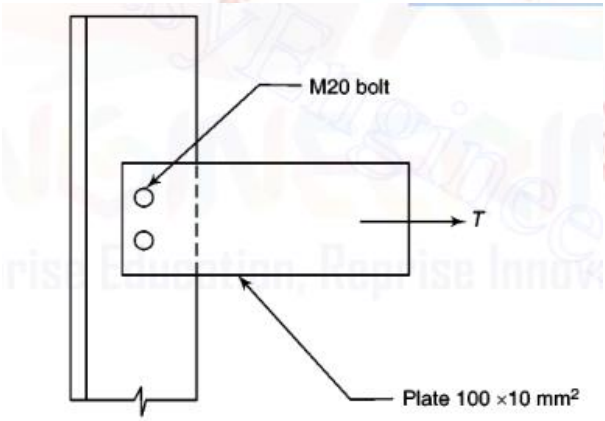
Q.NO	PART-C	BT Level	Competence
1.	Design a bracket connection to transfer an end reaction of 200 kN due to factored load as shown in the figure. The end reaction from the girder acts at an eccentricity of 250 mm from the face of the column flange. Design bolted joint connecting the Tee-flange with the column flange. Steel is of grade Fe 410 and bolts of grade 4.6 	BT-4	Analyse
2.	A bracket bolted to a vertical column is loaded as shown in figure. If M20 bolts of grade 4.6 are used, determine the maximum value of factored load P which can be carried safely. 	BT-4	Analyse

3.	A tie member of a roof truss consists of 2 ISA 90 mm X 60 mm X 10 mm. The angles are connected on either side of 12 mm gusset plate and the member is subjected to a pull of 400kN. Design the welded connection.	BT-6	Create
4.	Enumerate with example of the various method of fabrication used in steel structures.	BT-6	Create
5.	Explain briefly various types of loads to be considered in design of steel structures.	BT-2	Understand

UNIT II - TENSION MEMBERS

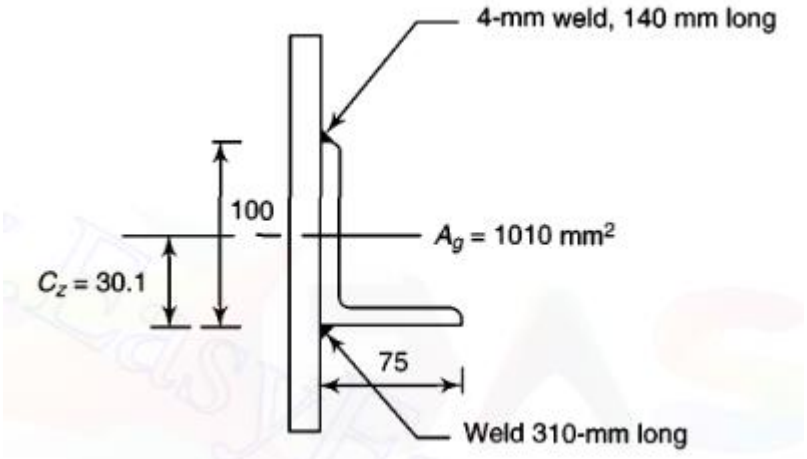
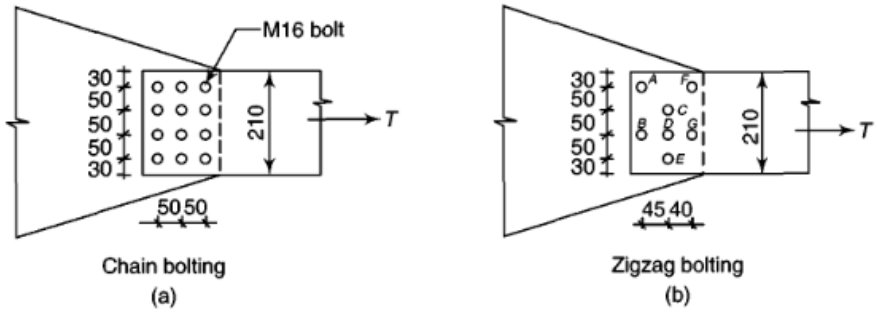
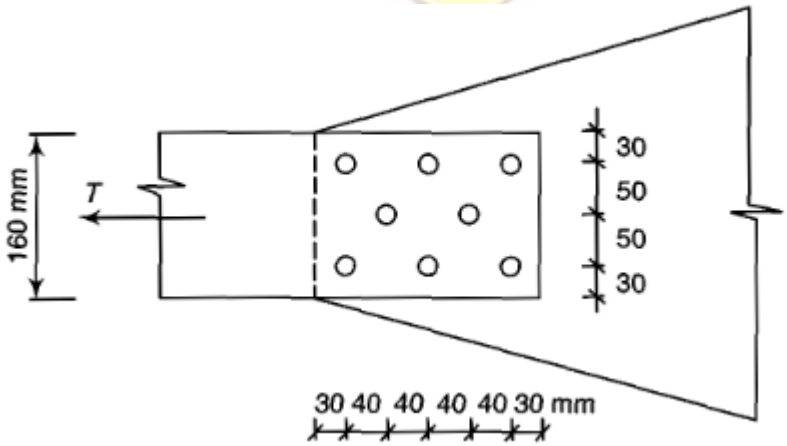
Types of sections – Net area – Net effective sections for angles and Tee in tension – Design of connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag

Q.NO	PART-A	BT level	Competence
1.	Define tension member?	BT-1	Remember
2.	Write the expression for calculating net area for angle section in tension.	BT-5	Evaluate
3.	Write down the limiting slenderness ratio for a tension member.	BT-5	Evaluate
4.	When gusset plates areused?	BT-1	Remember
5.	Formulate to calculate net area in (a) chain bolting (b) zigzag bolting.	BT-2	Understand
6.	Calculate the strength of a fillet weld of 6mm subjected to shear.	BT-1	Remember
7.	Classify the modes of failure in Tension member.	BT-2	Understand
8.	What do you mean by net effective area?	BT-1	Remember
9.	Develop a typical single bolted double cover butt joint and sketch the pitch, gauge and edge distance.	BT-3	Apply
10.	Discuss Tension Splice.	BT-1	Remember
11.	Discuss Shear Lag in Tension member?	BT-3	Apply
12.	Illustrate built-up members?	BT-6	Create
13.	What is the formula for design strength due to yielding of critical section?	BT-2	Understand
14.	Extend the equation for calculating the effective net area for a double angle joined back to back.	BT-3	Apply
15.	Examine lug angle and its use?	BT-4	Analyse
16.	Investigate the design strength due to block shear.	BT-4	Analyse
17.	Plan two specifications for designing of lug angle	BT-1	Remember
18.	Enumerate the factors that is to be considered for the design of tension members.	BT-6	Create
19.	Select any two typical cross sections of tension member using	BT-2	Understand

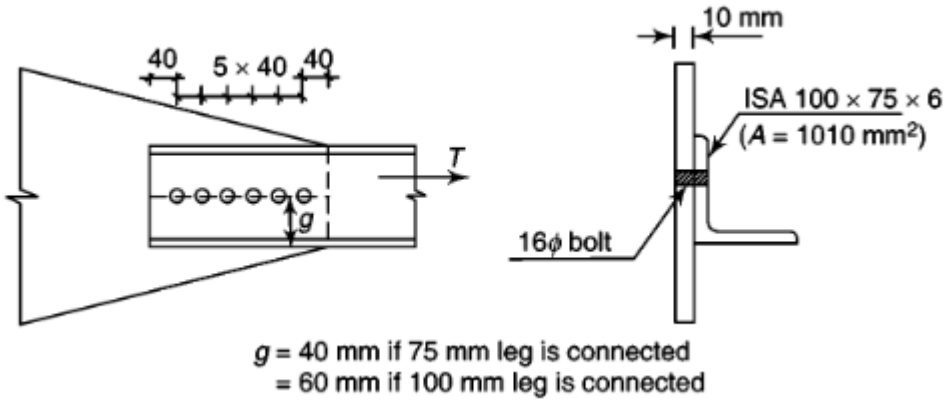
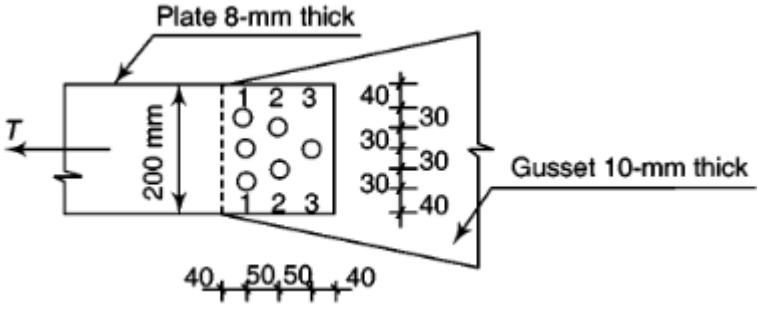
	angle sections with neat sketch.		
20.	Measure the maximum pitch when the angles are placed back to back?	BT-4	Analyse
21.	What is the net area A , for the tension member shown in Fig. in case of (a) drilled holes.  		
22.	What is the net area A , for the tension member shown in Fig. in case of (a) punched holes.  		
23.	Write short notes on riveted connection.		
24.	Write short notes on HSFG bolts.		
25.	Distinguish between black bolts and turned bolts.		

Q.NO	PART-B	BT Level	Competence
1.	A single angle 125mm x 75mm x 10mm is used as a tension member of a truss. The longer leg of the angle is connected to a gusset plate with 5 bolts of 20mm diameter. Determine the net effective area of the angle. Alternatively if the ends of the longer leg of the angle are welded to the gusset plate, determine the net effective area of the angle.	BT-2	Understand
2.	Two plates 150mm x 10mm are connected one over each flange of an	BT-1	Remember

	ISLB 200@194.2 N/m with 6 bolts of 16mm. Determine the design tensile strength of (i) the ISLB 200 section (ii) the two plates		
3.	Determine the tensile strength of a roof truss member 2 ISA 90x60x6 mm connected to the gusset plate of 8 mm thickness by 4mm weld. The effective length of weld is 200mm.	BT-3	Apply
4.	Design a tension member to carry a factored force of 340KN. Use 20mm diameter black bolts and a gusset plate of 8mm thick.	BT-1	Remember
5.	Design a single angle equal section 100x100x10 mm, connected to a gusset plate at the ends with 20mm diameter bolts with the connection length of 250mm to transfer tension.	BT-1	Remember
6.	Write the procedure for the design of tension members.	BT-4	Analyse
7.	Explain in detail about the modes of failure in Tension member.	BT-1	Remember
8.	Find the suitable dimensions so as to design a tension member using 2 unequal angles of size 120mm x 90mm x 8mm with a 10mm thick gusset plate. The short leg is outstanding. The pull on the member of 250kN.	BT-4	Analyse
9.	Explain the concept of shear lag in detail.	BT-2	Understand
10.	Discuss in detail about Tension member splice.	BT-5	Evaluate
11.	Find the suitable design for a single angle section for a tension member of a roof truss to carry a factored tensile force of 225KN. The member is subjected to the possible reversal of stress due to the action of wind. The length of the member is 3m.use 20mm shop bolts of grade4.6 for the connection.	BT-2	Understand
12.	Design as bridge truss diagonal subjected to a factored tensile load of 300 kN. The length of the diagonal is 3.0m. the tension member is connected to a gusset plate of 16mm thick with one line of 20mm diameter bolts of grade 8.8	BT-6	Create
13.	Determine the tensile capacity of the sections a) Angles are placed on the opposite side of gusset plates b) Angles are placed on the same side of gusset plates	BT-3	Apply
14.	Determine the tension capacity of 125 x 75 x 6 mm angle in Fe410 steel, assuming (a) Connection through longer leg by two rows of three M20 bolts, (b) Connection through shorter leg by a single row of six M24 bolts.	BT-4	Analyse
15.	Determine the tensile strength of a roof truss diagonal 100x75x6 mm (f_y& = 250 MPa) connected to the gusset plate by 4-mm welds as shown in Fig.		

			
16.	Determine the minimum net area of the plates as shown in Figs. (a) and (b) with a plate of size of 210x8 mm and 16-mm bolts. 		
17.	Determine the design tensile strength of a plate (1 60 x 8 mm) connected to a 1 0-mm thick gusset using 16 mm-diameter bolts as shown in Fig. 3.30, if the yield and the ultimate stress of the steel used are 250 MPa and 410 MPa, respectively. 		

Q.NO	PART-C	BT Level	Competence

1.	A single unequal angle 100x75 x 6 is connected to a 10-mm thick gussetplate at the ends with six 16-mm-diameter bolts to transfer tension as shown in Fig. Determine the design tensile strength of the angle assuming that the yield and the ultimate stress of steel used are 250 MPa and 41 0 MPa a) If the gusset is connected to 100mm leg b) If the gusset is connected to 75mm leg 	BT-5	Evaluate
2.	Identify the suitable design for a tension splice for a tension member sections 160mm x 10mm and 250mm x 12 mm. The member is subjected to a pull of 200 KN.	BT-5	Evaluate
3.	A tension member of a truss consists of a single channel ISLC 150@141.3N/m and is subjected to a factored tension of 300kN. Design the connection of the member to a gusset plate using lug angles. Provide welded connection.	BT-3	Apply
4.	A tension member of a roof truss carries a factored axial tension of 430kN. Design the section and the connection a) Without using lug angles b) Using lug angles	BT-3	Apply
5.	Determine the design tensile strength ofplate (200x8 mm) connected to 10-mm thickgusset using 20 mm bolts as shown in Fig. if the yield and the ultimate stress of the steel used are 250 MPa and 410 MPa, respectively 		

UNIT III – COMPRESSION MEMBERS

Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of laced and battened type columns.

Q.NO	PART-A	BT level	Competence
1.	Define compression member.	BT-1	Remember
2.	List the various types of compression members?	BT-1	Remember
3.	Distinguish column and strut.	BT-2	Understand
4.	Define effective length of a column.	BT-1	Remember
5.	State the uses of providing column base?	BT-1	Remember
6.	Design the various column connections with different sections.	BT-1	Remember
7.	Evaluate the effective length of column based on end conditions.	BT-1	Remember
8.	What do you mean by web buckling?	BT-1	Remember
9.	Discuss the purpose of providing battens in compound steel columns?	BT-2	Understand
10.	Distinguish slab base and gusseted base.	BT-2	Understand
11.	Classify the modes of failure in compression member.	BT-3	Apply
12.	Define buckling load and state the assumptions made in Euler's analysis.	BT-1	Remember
13.	Illustrate the lateral systems that are used in compound columns.	BT-4	Analyse
14.	Analyze slenderness ratio and its importance.	BT-4	Analyse
15.	Differentiate between slab base and gusseted base for steel columns.	BT-2	Understand
16.	Examine the cause for decrease in permissible stresses due toincrease in slenderness ratio.	BT-4	Analyse
17.	Why lacings are used in compression members?	BT-3	Apply
18.	Justify the purpose for providing anchors bolt in base plate?	BT-1	Remember
19.	Discuss about column splices and its types.	BT-1	Remember
20.	Relate local buckling with torsional buckling.	BT-3	Apply
21.	Differentiate laced and battend column.	BT-2	Understand
22.	Draw the diagram of buckling of column.	BT-1	Remember
23.	What are the assumptions made in Euler's analysis?	BT-2	Understand
24.	What are the buckled modes for different end conditions?	BT-2	Understand
25.	Define single lacing & double lacing.	BT-1	Remember

Q.NO	PART-B	BT Level	Competence
1.	A rolled steel beam section HB 350 @ 0.674 kN/m is used as a stanchion. If the unsupported length of the stanchion is 4 m, evaluate safe load carrying capacity of the section.	BT-2	Understand
2.	Find the suitable design for a built-up column consisting of two channels connected by batten to carry an axial load of 800 KN; the effective length of the column is 6 m.	BT-1	Remember
3.	Explain the step by step procedure for finding the load carrying capacity of a compression member.	BT-2	Understand
4.	Determine the design axial load on the column section ISMB 400, given that the height of the column is 3.5 m and that it is pin-ended. Also assume the following: fy= 250 N/mm^2, fu=410 N/mm^2; E = 2×10^5 N/mm^2	BT-3	Apply
5.	i) List out the maximum values of effective slenderness ratio for various members as per IS recommendations. ii) Analyse the different failure modes of column in detail	BT-4	Analyse
6.	Design a column using a rolled steel l-section with cover plates to carry a factored axial load of 2000kN. The effective length in both the planes is 5m. Take fy = 250 MPa and E= 200 GPa	BT-1	Remember
7.	Illustrate in detail about column splice and mention its purpose	BT-3	Apply
8.	A column of ISMB 400 is subjected to an axial force of 750kN. Analyse and design suitable base plate. Assume necessary data required.	BT-4	Analyse
9.	Calculate the compressive resistance of a compound column consisting ISMB 500 with one cover plate 350 x 20 mm on each flange and having a length of 5 m. Assume that the bottom of column is fixed and top is rotation fixed, translation free.	BT-1	Remember
10.	A built up column consists ISHB 400@ 77.40 kg/m with one 300mm x 12mmflange plate on each side. The column carries an axial load of 2600kN. Determine the suitable dimension for a gusseted base, if the column is supported on concrete pedestal with a bearing pressure of 5N/mm^2.	BT-1	Remember
11.	Describe about laced column and also explain its design and specifications.	BT-2	Understand
12.	Design a column with single lacing system to carry a factored axial load of 1500kN. The effective height of the column is 4.2m. Use two channels placed toe to toe.	BT-2	Understand
13.	A discontinuous strut of length 4 m consists of two unequal angles ISA 100×75×8 and is connected to a 10 mm thick gusset plate by its longer leg. Determine the strength if it is connected on the: 15) Opposite side of the gusset plate ii) Same side of the gusset plate	BT-4	Analyse
14.	Design a suitable slab base for a column section ISHB 400@ 822 N/m. Supporting an axial load 500kN. The base plate is to rest on a concrete pedestal of M20 grade concrete.	BT-4	Analyse
15.	A column 4m long has to supported load of 6000 kN. the column is effectively held at both ends and restrained in direction at one of	BT-2	Understand

	the eds. Design the column using beam sections and plates.		
16.	Design a single angle stut connected to the guesst plate to carry 180kN factored load. the length of the strut between centre to center connection is 3m.	BT-2	Understand
17.	Design a laced column with two channels back to back of length an axial factored load of 1400kN. The column may be assumed to have restrained in positon but not in direction at both ends (hinged ends).	BT-2	Understand

Q.NO	PART-C	BT Level	Competence
1.	A batten column of 10-m long is carrying a factored load of 1150 kN. The column is restrained in position but not in direction at both ends. Design a built up column using channel sections placed back to back.	BT-1	Remember
2.	A built up column consists of ISHB 400 @ 77.4 kg/m with one 300 mm x 12 mm flange plate on each side. The column carries an axial load of 2600 kN. Design a gusseted base if the column is supported on concrete pedestal with a bearing pressure of 5 N/ mm^2.	BT-4	Analyse
3.	Find the suitable design for a laced column for an axial load of 1200kN with an effective span of 7.5m has one end fixed and other end hinged. Use channels for main members and an angle for lacing	BT-2	Understand
4.	A steel column ISHB 400 @ 759.3 N/m is subjected to a factored axial load of 2000 kN. 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 of M20 grade.	BT-3	Apply
5.	An upper storey column ishb 300@ 577N/m carries a factored load of 1200kN and a factored moment of 12kN-m. its is to be spliced with lower storey column ISHB 400@ 806N/m.Design suitable splice.	BT-2	Understand

UNIT IV - BEAMS

Beams: Types of steel beams- Modes of failure - Design of laterally supported and unsupported beams – Built up beams – Beams subjected to uniaxial and biaxial bending- Design for strength and serviceability- Web yielding- Web crippling-Bearing stiffeners. Welded plate girder, Components-Stiffener-Analysis and design using IS 800-2007 of welded plate girder.

Q.NO	PART-A	BT level	Competence
1.	Define shape factor and what is meant by slender section?	BT-1	Remember
2.	Write the various factors affecting the lateral-torsional buckling strength	BT-1	Remember
3.	What is laterally unsupported beam? Give an example.	BT-1	Remember
4.	Demonstrate the reasons behind splicing in plate girder	BT-3	Apply
5.	Evaluate the economical depth of a plate girder?	BT-1	Remember

6.	Write about the Box girders.	BT-3	Apply
7.	Construct the failure mode of laterally unsupported beams	BT-1	Remember
8.	What do you mean by castellated beam?	BT-1	Remember
9.	Explain effective sectional area in column design	BT-4	Analyse
10.	Write the formula for calculating the thickness of beam bearing plate	BT-3	Apply
11.	Discuss about built up beams	BT-2	Understand
12.	Distinguish web buckling and web crippling?	BT-4	Analyse
13.	What are the classifications in Stiffeners?	BT-1	Remember
14.	Examine the shear resistance of steel beams	BT-4	Analyse
15.	Define laterally restrained beam. Why do compression flanges require lateral support?	BT-1	Remember
16.	What do you mean by curtailment of flanges?	BT-2	Understand
17.	Justify the purpose for providing the bearing stiffener and where it is used?	BT-1	Remember
18.	List the design consideration in design of steel beams.	BT-2	Understand
19.	What is web crippling?	BT-1	Remember
20.	Discuss the elements of the plate girder.	BT-2	Understand
21.	Draw the curvature for flexural member performance and the classification of cross sections.	BT-1	Remember
22.	List the various factors affecting the lateral-torsional buckling strength.	BT-1	Remember
23.	What are the classifications in Stiffeners?	BT-1	Remember
24.	Write the Special features of limit state design method	BT-1	Remember
25.	Write Short notes on Purlin	BT-1	Remember

Q.NO	PART-B	BT Level	Competence
1.	An ISMB 500 section IA used as a beam over a span of 6 m, with simply supported ends. Determine the maximum factored uniformly distributed load that the beam can carry if the ends are restrained against torsion but compression flange is laterally unsupported.	BT-1	Remember
2.	Find the suitable design for a simply supported steel joist with a 4.0m effective span carries a UDL of 40kN/mover its span inclusiveof self-weight. The beam is laterally unsupported.	BT-1	Remember
3.	Find the suitable design for a simply supported beam of effective span 10m carrying a factored load of 30kN/m. The compression flange of the beam is laterally restrained all along and provided with stiffened end bearing of 100mm wide. The overall depth of thebeam is restricted to 450mm.	BT-1	Remember
4.	Estimate the suitable built up beam section for a span of 8m to carry a uniformly distributed load of 15kN/m and a central concentrated load of 100 kN. The beams is laterally supported through out.Show the curtailment of plates also	BT-2	Understand

5.	Write short notes on the design of laterally unsupported beam.	BT-1	Remember
6.	A welded plate girder of span 25m is laterally restrained throughout its length. It has to carry a load of 80 kN/m over the whole span besides its weight. Design the girder without intermediate transverse stiffeners.	BT-2	Understand
7.	Explain the step by step procedure for design of vertical, intermediate and horizontal stiffeners in a plate girder.	BT-2	Understand
8.	A cantilever beam of length 4.5 m supports a dead load (including self weight) of 18 kN/m and a live load of 12 kN/m. Assume a bearing length of 100 mm. Analyze and Design the beam.	BT-4	Analyse
9.	A welded plate girder has i) Each top and bottom flange = 435 x 28 mm and ii) Web 1250 x 10 mm. Predict the design of vertical and horizontalstiffeners.	BT-2	Understand
10.	Design a bearing stiffener for a welded plate girder with the following specifications. Web = 1000mm X 6mm thick. Flanges = 2 Nos. of 350X20mmplate on each side. Support reaction = 350kN.Width of the support = 300mm.	BT-4	Analyse
11.	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	BT-1	Remember
12.	Analyze and Design a laterally supported beam of effective span 5 m for the following data. Grade of steel: Fe 410 Factored maximum B.M. = 180 kN-m Factored maximum S. F. = 220 kN Check for deflection is not required	BT-4	Analyse
13.	A simply supported beam of span 3.25m consists of rolled steel section ISLB 325 @ 422.8 N/m. Determine the design bending strength of the beam, if the beam is laterally unsupported.	BT-3	Apply
14.	Show the design of web and flanges for a reverted plate girder is simply supported over an effective span of 16m. It carries a UDL of 80kN/m in addition to its self weight. And two points of 400kN each at 4m from their supports.	BT-3	Apply
15.	A simply supported steel joist awith 4m effecctive span carries a unifomly distributed load of 40kn over its span inclusive of self weight. the beam is supported through out. select a suitable section (f_y= 250N/mm^2) and check its ssafety.	BT-3	Apply
16.	Design a beam of 5m effective span, carrying a uniform load of 20kN/m if the cmpression flanges is laterally un supported assume (f_y= 250N/mm^2).	BT-3	Apply
17.	Design a beam of effective span 6m and subjected to a momet of 105.3X106 Nmm for the following conditions: a) the compression flange is laterally unsupported throughout, b) the beam is encased in concrete. checks for deflection and shear are not requiured assume (f_y= 250N/mm^2).	BT-3	Apply

Q.NO	PART-C	BT Level	Competence
1.	Calculate the design bending strength of ISLB 300 @ 0.369 kN/m considering the beam to be (a)Laterally supported (b)Laterally unsupported Assume the design force is less the design shear strength and is of low shear. The effective length of the beam (LLT) is 4 m. Assume Fe410 grade of steel.	BT-2	Understand
2.	A simply supported steel joist of 4 m effective span is laterally supported throughout. It carries a total udl of 40 kN (service load inclusive of self weight). Design an appropriate section using steel of grade Fe 410.	BT-3	Apply
3.	Design a simply supported steel joist of 5 m effective span, carrying a uniformly distributed load 12 kN/m if compression flange of the joist is laterally unrestrained.	BT-4	Analyse
4.	Design rolled steel I section for a simply supported beam with a clear span of 6 m. It carries a UDL 50 kN/m excluding self weight of the girder. The beam is laterally supported.	BT-3	Apply
5.	A beam is to span an opening of 9m. it carries a uniform load of 12kN/m. The depth of beam is limited to 450mm from clear head room requirements. design the cross section of the beam assume (f_y= 250N/mm^2).	BT-2	Understand

UNIT V- INDUSTRIAL STRUCTURES

Roof Trusses - calculation of dead load- live load & wind load - Design of joints - supports members for pitched roof truss – Design of purlins and Design principles of gantry girder.

Q.NO	PART – A	BT Level	Competence
1.	Explain the co efficient of external wind pressure.	BT-2	Understand
2.	Write down the formula for calculating the design wind speed as per IS 800-2007.	BT-1	Remember
3.	Write the uses of sag rod in a roof truss	BT-3	Apply
4.	Explain about the importance of steel decking.	BT-2	Understand
5.	State the necessity of curtailment of flange plates in plate girder.	BT-4	Analyse
6.	What is the purpose of the purlin in a roof truss?	BT-1	Remember
7.	What are the loads to be considered for the design of gantry girder?	BT-4	Analyse
8.	List the criteria to be adopted for arriving at the spacing of truss?	BT-1	Remember

9.	List the various components of a roof truss.	BT-3	Apply
10.	Classify the type of truss based on span.	BT-3	Apply
11.	Define bracing and Why bracings required in roof trusses?	BT-1	Remember
12.	Define drag force.	BT-1	Remember
13.	Define pitch of trusses	BT-1	Remember
14.	Evaluate why impact factor is considered in the computation of loads acting on gantry girder?	BT-2	Understand
15.	Define gantry girders	BT-1	Remember
16.	Which section is recommended for gantry girder?why	BT-2	Understand
17.	Define Drift Analysis	BT-1	Remember
18.	Explain recommended allowable stresses and deflection for gantry girder?	BT-2	Understand
19.	Name the commonly used roof coverings.	BT-2	Understand
20.	Define end bearing in roof trusses?	BT-1	Remember
21.	Why are simply supported girders preferred to two-span gantry girders?	BT-1	Remember
22.	What are the components of a crane runway system?	BT-1	Remember
23.	List the loads that should be considered while designing a gantry girder.	BT-1	Remember
24.	What is the difference between surge load and drag load of cranes?	BT-1	Remember
25.	List the different profiles of cross sections which are used for gantry girders	BT-1	Remember

Q.NO	PART – B	BT Level	Competence
1.	i.Classify the different types of roof truss with neat sketches (7) ii.Give general guidelines for fixing spacing of roof trusses (6)	BT-2	Understand
2.	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 x 30 m	BT-1	Remember
3.	An industrial roof shed of size 20 mx30 m is proposed to be constructed at Mangalore near a hillock of 160 m and slope is 1 in	BT-1	Remember

	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		
4.	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.	BT-1	Remember
5.	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 = 30^{o}Spacing of Purlin = 2m c/c Wind pressure = 1.5 kN/m^{2,} Roof coverage= A.C Sheeting weighing 200 N/m^2 , Provide a channel section Purlin.	BT-4	Analyse
6.	Find the suitable design for 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 the 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/mm^2 Design the main gantry section. Connection design not required.	BT-1	Remember
7.	Calculate 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.	BT-3	Apply
8.	Determine the basic wind intensity for an industrial building situated in Chennai using the data provided Life of the structure 50 years, Terrain category = 2, Size of the building - 20m x 40m, Height of eye board - 10m, Topography: Slope < 3^o, Slope 1 in 4.	BT-2	Understand
9.	Identify the suitable purlin in an industrial building, the trusses of	BT-3	Apply

	16m span and 4m rise are spaced at 8m apart. The building is in medium wind zone in an industrial area of plain land.		
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.	BT-2	Understand
11.	Recommend the design for a channel section purlin for the following data: Spacing of trusses =4.2 m Spacing of purlin= 2m Live load on galvanized iron roofing sheets = 0.6 kN/m^2 Wind load = 1.4 kN/m^2 Slope of main rafter = 31^0	BT-4	Analyse
12.	What is a gantry girder? Explain its components and loading considerations in detail.	BT-4	Analyse
13.	Write down the step by step procedure of design of gantry girder	BT-3	Apply
14.	Write down the step by step procedure of design of Purlins.	BT-3	Apply
15.	Write down the expressionsfor maximum shear force, bending moment, and deflection at mid-span for a simply supported beam with two moving loads, each with a value K.	BT-1	Remember
16.	A 50 kN hand-operated crane is provided in a building and has the following data: Centre-to-centre distance of the gantry beam (width of the building) 16m Longitudinal spacing of columns (span of gantry) 7.5m Weight of the crane 40 kN Wheel spacing 3m Minimum hook approach l m Yield stress of steel 250 MPa Weight of the crab 10kN Design a simply supported gantry girder assuming lateral support to it.	BT-3	Apply
17.	What are the requirements to be considered by the designer while	BT-3	Apply

	selecting a crane and designing a crane supporting structure?		

Q.NO	PART-C	BT Level	Competence
1.	A Power house building 25m high is to be designed in Darbhanga City. Compute the basic wind pressure.	BT-2	Understand
2.	Briefly explain about Gantry Girder and Crane Girder.	BT-3	Apply
3.	List out various elements of the roof truss and mark all its significance	BT-4	Analyse
4.	Design of gantry girder for an electric overhead crane with the following data: Capacity of crane= 100 KN. Weight of trolley=40 KN, Weight of crane girder=200KN, Span of crane girder=18m.Centre to Centre distance between columns=8m,Minimum clearance between trolley and gantry girder = 1.2 m centre distance of crane wheels=3m	BT-3	Apply
5.	Determine the moments and forces due to the vertical and horizontal loads acting on a simply-supported gantry girder given the following data. 1. Simply-supportedspan = 6 m 2. Crane 5 wheel centres = 3.6 m 3. Self-weight zyxwvof the girder (say) = 1.6 kN/m 4. Maximum crane wheel load (static) = 220 kN zyx5. Weight of crab/trolley = 60 kN 6. Maximum hook load = 200 kN Calculate also the serviceability deflection (working load)	BT-3	Apply