SRM VALLIAMMAI ENGINEERING COLLEGE

(AN AUTONOMOUS INSTITUTION)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF CIVIL ENGINEERING

ME STRUCTURAL ENGINEERING

QUESTION BANK

I SEMESTER

1917101-ADVANCED CONCRETE AND STEEL STRUCTURES

Regulation – 2019

Academic Year 2022-2023

Prepared by

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SUBJECT: 1917101-ADVANCED CONCRETE AND STEEL STRUCTURES

SEM / YEAR: I/I

UNIT-I DESIGN PHILOSOPHY			
Limit state design - beams, slabs and columns according to IS Codes. Calculation of deflection and crack width according to IS Code. Interaction curve generation for axial force and bending. Comparative study with Euro Code & ACI Code			
PART - A			
Q.no	**Questions**	**BT Level**	**Competence**
1.	Write an expression for short term deflection of beams due to applied loads.	BT-1	Remembering
2.	How can the defection to be controlled?	BT-1	Remembering
3.	Write a note on factor affecting crack width in beams.	BT-1	Remembering
4.	State types of cracks.	BT-1	Remembering
5.	What is meant by Shrinkage and Thermal Cracking?	BT-1	Remembering
6.	What is the % of minimum reinforcement in slab and columns?	BT-1	Remembering
7.	What are the ill effects of large deflection?	BT-1	Remembering
8.	Compare one-way slab and two-way slab.	BT-2	Understanding
9.	Write down the factors affecting the crack width.	BT-2	Understanding
10.	Summarize the Codal provisions to control deflection and crack width of RC Slabs crack width of RC Slabs.	BT-2	Understanding
11.	What is precambering?	BT-3	Applying
12.	What is the minimum percentage of reinforcement used in column as per I.S code?	BT-3	Applying
13.	Calculate the effective length of a column if its unsupported length is 4m when both ends are fixed.	BT-4	Analyzing
14.	What are the different limit states of design?	BT-4	Analyzing
15.	Differentiate and state why limit state method of design is superior from working stress method of design.	BT-4	Analyzing
16.	What are called slender columns?	BT-5	Evaluating

17.	How will you control cracking of reinforced concrete structural element?	BT-5	Evaluating
18.	Explain the use of partial safety factors.	BT-5	Evaluating
19.	Write down the expression for crack width as per IS456-2000.	BT-6	Creating
20.	Discuss about balanced, under-reinforced and over-reinforced section? Judge which is more predominant section for design.	BT-6	Creating
21.	Justify any two guidelines to select the cross sectional dimensions of RC beam.	BT-6	Creating
22.	Select any two assumptions are made in elastic theory method.	BT-5	Evaluating
23.	Define crack width under Long term loading.	BT-4	Analyzing
24.	Differentiate shrinkage cracking and thermal cracking.	BT-6	Creating
25.	Define modular ratio.	BT-4	Analyzing
PART - B			
1.	The Short Spiral Column subjected to a Pu = 2100 KN and M_u=187.5 KN-m using M25 grade of concrete and Fe415 grade of Steel. the preliminary diameter of column may be taken as 500 mm. Examine the Design of column in detail	BT-1	Remembering
2.	A simply supported one way slab system designed with a clear span of 4m, simply supported on 230mm thick masonry walls, and subjected to a live load of 4KN/m^2 and a surface finish of 1KN/m^2. Assume Fe415 steel. Assume that the slab is subjected to moderate exposure conditions. Compute the maximum short-term deflection due to dead loads + Live loads. Determine using the concept of I_{eff} specified in IS 456-2000.	BT-1	Remembering
3.	A simply supported one way slab system designed with a clear span of 4m, simply supported on 230mm thick masonry walls, and subjected to a live load of 4KN/m^2 and a surface finish of 1KN/m^2. Assume Fe415 steel. Assume that the slab is subjected to moderate exposure conditions. Compute the maximum short-term deflection due to dead loads + Live loads. Determine using the concept of Effective curvature given in BS8110-1997.	BT-2	Understanding
4.	Determine the maximum short term deflection under DL and LL for the doubly reinforced beam, located inside a building in a coastal town, is simply supported on two 230mm thick and 6m apart masonry walls (c/c). The beam has to carry, in addition to its own weight, a distributed live load of 10kN/m and dead load of 5kN/m. Size of the beam limited to 250mmX400mm, and that it has to carry, in addition to a concentrated dead loads of 30KN Placed at the midspan point. Design the beam section for maximum moment at midspan. Also determine the short-term deflection due to live loads only.	BT-2	Understanding
5.	Estimate the deflection beam of breadth 300mm, total depth 600mm, span 4m, subjected to a maximum bending moment due to characteristic dead and live loads of 210KN-m, of which 60% is due to permanent loads.	BT-3	Applying

6.	A rectangular beam 200 mm wide and 400 mm deep up to the centre of reinforcement has to resist a factored moment of 40 kNm. Calculate the reinforcement of the section. Use M25 concrete and Fe 415 steel.	BT-4	Analyzing
7.	A beam of width 450mm, depth 750 mm and cover of reinforcement 40mm is reinforced with 3 rods of 40mm ($3780mm^2$) diameter. Calculate the crack width when the section is subjected to a bending moment of 490kNm at the following points. 1. At the point on the side of the beam 250 mm below the neutral axis 2. At a point midway between bars at the tension face. 3. At the bottom corner 4. At the tension face directly under the bar.	BT-4	Analyzing
8.	A reinforced concrete wall is 100mm thick. Determine the critical ratio of horizontal steel required to control shrinkage cracks with grade 25 concrete and grade 415 steel. If 10mm grade 415 at 300mm spacing is provided on both faces of the wall estimate the spacing of the cracks and its width due to a drop in temperature of 20^0C. Assume the following data: 1.Drying shrinkage of concrete= $100X10^{-6}$ 2. Coefficient of thermal expansion on= $10\mu/^0C$ 3.Modulus of concrete in tension $E_c=10X10^3$ N/mm^2 4. Strength of concrete in tension=$1.5N/mm^2$	BT-5	Evaluating
9.	A reinforced concrete cantilever beam of 4 m span has rectangular cross section of size 300mmX600mm overall depth. It is reinforced with 6 bars of 20mm dia. On tension side. It is reinforced with 2 bars of 20 mm dia. And one bar of 12mm dia on compression side. Compute the total deflection at the free end when it is subjected to an UDL of 25kN/m at service state. Of the load is permanent in nature. Use M20 Concrete and Fe 415 steel.	BT-5	Evaluating
10.	Design a biaxial lay loaded braced rectangular column deforming in single curvature for the following data. Factor axial load P_u=1500Kn, factored bending moments Mux_1 and Muy_1 at bottom are 200kNm and 100kNm and 60kNm respectively. Unsupported length is 8 m and effective lengths l_{ex} and l_{ey} are 7m and 5.5m respectively. Consider the size of the column as 400mm X 500mm.	BT-5	Evaluating
11.	A simply support reinforced concrete beam of rectangular section 250mm wide by 450mm overall depth is used over an effective span of 4m. The beam is reinforced with 3 nos.20mm dia Fe415 at an effective depth of 400mm. Two hanger bars of 10mm dia are provided. The self-weight together with dead load on the beam is 4kN/m and service live load is 10 kN/m. Using M20 grade concrete and Fe415 grade steel. Compute (a) Short term deflection (b) Long term deflection	BT-5	Evaluating

12.	A simply supported on way slab 3.5m span carries live load of 4kN/m^2 and floor finish of 1.5kN/$m^{2.}$ The depth of the slab is 160mm with a clear cover of 30mm. the steel consist of 8mm dia 90mmc/c. assume permanent load equal to dead load plus 20% of live load. Calculate the total deflection use M25 concrete and Fe 415 steel.	BT-5	Evaluating
13.	A rectangular beam section of width 250 mm and effective depth 500 mm is subjected to an ultimate moment of 50kNm, ultimate shear force of 60 kN and ultimate torsional moment of 20 kNm. Design the beam.	BT-6	Creating
14.	Design a RCC slab for a room measuring 5m x 6m size. The slab is supported on all the four edges, with corners held down and carries a superimposed load of 3 kN/m^2, inclusive of floor finishes. Assume M20 concrete & Fe415	BT-6	Creating
	PART C		
1.	A simply support reinforced concrete beam of rectangular section 250mm wide by 500 mm overall depth is used over an effective span of 4m. The beam is reinforced with 3 nos.20mm dia Fe415 at an effective depth of 400mm. Two hanger bars of 10mm dia are provided. The self-weight together with service load on the beam is 5kN/m and service live load is 10 kN/m. Using M25 grade concrete and Fe415 grade steel. Compute. (a) Short term deflection (b)Long term deflection	BT-6	Creating
2.	Design a doubly reinforced concrete beam of rectangular section using the following data: Effective span=5m Width of beam=250mm Over all data=500mm Service load (DL+LL) =40kN/m. Effective cover=50mm M20 grade of concrete and Fe415 HYSD bars.	BT-4	Analyzing
3.	A T beam has the following dimension. 1500mm Flange width, thickness or flange 100mm, effective depth 500mm, width of web is 300mm. ultimate bending moment is 450KNm.Find the reinforcement required for the section.	BT-4	Analyzing
4.	A reinforced cantilever concrete beam is 250mm by 500mm. Bending moment at support due to an udl is 120kN.m. 50% of moment is due to permanent load. Check the beam for deflection. The beam is reinforced with 3 bars of 22mm in tension with an effective cover of 50mm.	BT-4	Analyzing
	UNIT II SPECIAL RC ELEMENTS		
Design of slender columns - Design of RC walls. Strut and tie method of analysis for corbels and deep beams, Design of corbels, Deep-beams and grid floors, Pile caps.			
	PART - A		
Q.no	**Questions**	**BT Level**	**Competence**
1.	Define Slender column	BT-1	Remembering

2.	What do you understand by RC walls?	BT-1	Remembering
3.	What is meant by punching shear?	BT-1	Remembering
4.	Classify RC walls according to their behaviour.	BT-4	Analyzing
5.	Compare the interaction between structural frame and shear wall.	BT-2	Understanding
6.	Distinguish the main difference between a braced wall and an un-braced wall	BT-4	Analyzing
7.	Identify the difference between Slender Braced and slender Unbraced Concrete Walls	BT-3	Applying
8.	Briefly explain about 'corbel' with a neat sketch.	BT-5	Evaluating
9.	Examine the function of horizontal steel in corbel	BT-4	Analyzing
10.	Describe about the function of lateral ties in a RC column..	BT-5	Evaluating
11.	How a nib is different from cantilever beam? Draw a neat sketch.	BT-1	Remembering
12.	Explain the 'strut and tie method' of analysis for a corbel. Write the equation of lever-arm (z/d).	BT-2	Understanding
13.	How a deep beam differs from ordinary RC beam? Under what circumstances deep beams are preferred?	BT-1	Remembering
14.	What is the development length adopted for deep beams? Calculate it for 16 mm mild bars in M20 grade concrete	BT-5	Evaluating
15.	How do you calculate the lever-arm for a deep beam?	BT-1	Remembering
16.	Why side face reinforcements are extremely important in deep beams?	BT-1	Remembering
17.	Explain Pile Cap	BT-2	Understanding
18.	Define Strut.	BT-1	Remembering
19.	Identify the structural action of grid floor system	BT-3	Applying
20.	List the advantages of grid floors	BT-4	Analyzing
21.	Discuss any two advantages of introducing compression steel in R.C beams.	BT-6	Creating
22.	On what condition long column is more suitable?	BT-5	Evaluating
23.	Name the two code requirements on slenderness limits.	BT-2	Understanding
24.	Distinguish between braced and un-braced columns.	BT-3	Applying
25.	Explain the function of the traverse reinforcements in a reinforced concrete column.	BT-2	Understanding
	PART B		
1.	(i) Briefly classify different types of walls (ii) Explain the following in detail a) Types of Load on wall b) Slenderness of walls c) Braced and unbraced walls	BT-4	Analyzing
2.	A plain concrete wall of 4 m high, 6 m long and 200 mm thick is restrained against rotation at its base and unrestrained at the ends. Examine the load the wall can carry. Assume f_{ck} = 25 N/mm^2, f_y = 500 N/mm^2. Design the wall if it has to carry a factored load of 600kN/m	BT-6	Creating

3.	Estimate and design the reinforcement in the slender column which is restrained against sway using the following data\ Size of the column = 400mmX400mm M20 grade of concrete and Fe415 HYSD bars. Effective Length of column L_{ex} & L_{ey} = 6m Unsupported length of column(L) = 7m P_u=1500kN,M_{ux} & M_{uy} = 40kNM at top & 20kNM at bottom	BT-5	Evaluating
4.	Explain about Deep beam, its application, types and behaviour at limit state in detail.	BT-2	Understanding
5.	Design a reinforced concrete wall of 4.6m height to support a factored load of 650kN/m length and factored moment of 30kN/m at right angles to the length of wall. The distance between cross walls is 4.0m.the materials to be used in constructions are M25 grade concrete and Fe 415 grade steel.	BT-5	Evaluating
6.	Explain about Design of Concrete walls for flexure and Rules for detailing of steel in concrete walls.	BT-2	Understanding
7.	Develop a corbel design for a 350mm square column to support an ultimate vertical load of 600kN with its line of action 200mm from the face of the column. Use M20 grade concrete and Fe 415 grade steel.	BT-3	Applying
8.	Design a RC corbel to carry load of 350 kN acting at a distance of 250 mm from the face to face of a column of size 300 x 450 mm. the corbel is provided on the 300 mm face, sketch the reinforcement details.	BT-6	Creating
9.	Design a reinforced concrete wall of height 6.6m for a staircase to support a factored load of 525kN/m length and factored moment of 21kN/m at right angles to the plane of wall. The wall is restrained in position and direction at the bottom, and in position at the top. The materials to be used in constructions are M20 grade concrete and Fe 415	BT-4	Analyzing
10.	Explain in detail about Strut and tie method of analysis for concrete structures.	BT-5	Evaluating
11.	Analyze and construct a simply supported deep beam with width = 250mm, overall depth (D) = 3500mm, width of supports = 500mm, clear span = 5m.Live load on the beam = 150kN/m at service state. Adopt M20 grade concrete and Fe415 steel.	BT-4	Analyzing
12.	Design pile cap foundation with the given data: Load F_y = 800 kN, fc = 25 MPa, f_y = 415 MPa, Column Dimension = 250 mm x 250 mm. Pedestal ht= 500 mm Pile Data- Dia of pile= 400 mm. Vertical capacity = 250 kN, Horizontal capacity = 100 kN Uplift capacity = 80 kN and enumerate the suitable reinforcements with grid floor	BT-4	Analyzing
13.	Summarize the step by step procedure for Design of Pile cap.	BT-2	Understanding
14.	Illustrate the Various Methods of Analysis of Grid Floor Frame in detail.	BT-2	Understanding
PART C			

1.	Summarize the step by step procedure for Design of Corbels using IS code.	BT-2	Understanding
2.	A 125mm thick concrete wall of height 3.3m with a length of 4.8m between cross walls is tom support a factored load of 725 kN/m. Design the wall using M20 grade concrete and Fe415 steel.	BT-3	Applying
3.	Estimate and design Design a RC corbel to carry load of 400 kN acting at a distance of 200 mm from the face of the column, of size of the column is 300 x 400 mm., use M20 grade concrete and Fe415 steel sketch the reinforcement details.	BT-5	Evaluating
4.	A transfer Deep beam 5.25 m length supports two columns located at 1.75 m from each end. Column loads = 3750 kN . Total depth of the beam = 4.2m and width of support = 520mm.Concrete Grade = M40, Fe 415 steel. Design and Detail the Deep beam.	BT-4	Analyzing

UNIT III FLAT SLABS AND YIELD LINE BASED DESIGN

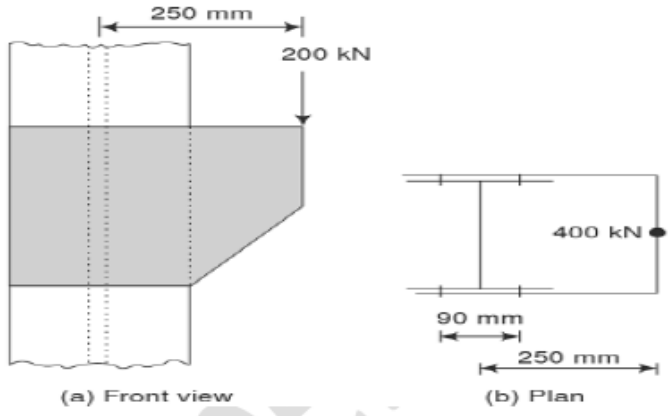
Design of flat slabs and flat plates according to IS method – Check for shear - Design of spandrel beams - Yield line theory and Hillerborg's strip method of design of slabs. Yield line theory - Equilibrium and Virtual work method - Analysis and design of square slab with different boundary conditions subjected to UDL and concentrated loads - Analysis and design of rectangular slab with different boundary conditions subjected to UDL and concentrated loads

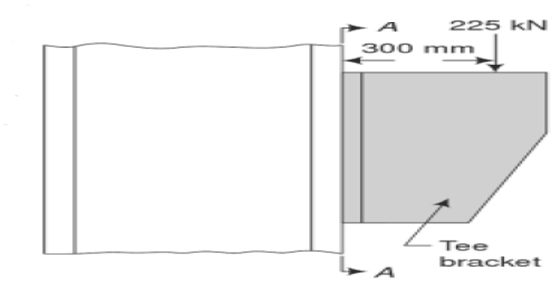
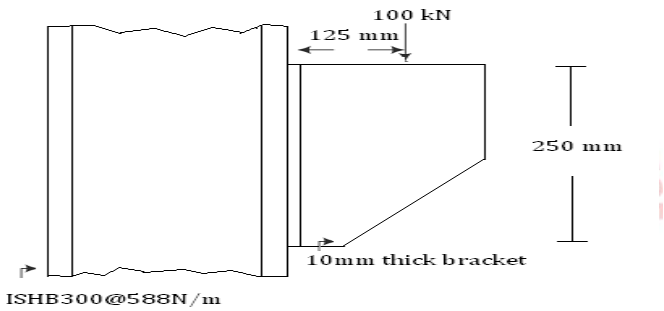
PART A

1.	Explain about the components of flat slab with neat sketch.	BT-4	Analyzing
2.	Write down the Advantages and disadvantages of flat slab?	BT-6	Creating
3.	State the assumptions of equivalent frame method.	BT-1	Remembering
4.	Point out are the assumptions made in yield line theory	BT-4	Analyzing
5.	Brief the concept of punching shear.	BT-2	Understanding
6.	Give the characteristics of yield line	BT-2	Understanding
7.	What are the limitations of yield line theory?	BT-1	Remembering
8.	Debate the limitations of Hillerborg's strip method	BT-5	Evaluating
9.	Differentiate between yield line and strip line	BT-4	Analyzing
10.	Write down the steps in the design for spandrel beams.	BT-6	Creating
11.	Relate how to increase the shear capacity of flat slab with ordinary slab	BT-2	Understanding
12.	Define the terms drop and column head.	BT-1	Remembering
13.	The yield line analysis is possible only for slabs and not possible foe beams state the reasons. Justify.	BT-5	Evaluating
14.	State the function of drop panel and column capital in a flat slab.	BT-1	Remembering
15.	Draw any 4 yield line patterns with various support conditions.	BT-3	Applying
16.	What are the forces to be considered in the design of spandrel beams?	BT-1	Remembering
17.	What are the types of shear action to be checked in the design of a flat slab?	BT-2	Understanding
18.	List out the various methods available for the analysis of flat slab.	BT-1	Remembering
19.	Interpret lower bound theorem with upper bound theorem.	BT-3	Applying

20.	Sketch the division of load paths in simply supported rectangular Rc slabs according to Hillerborgs pattern.	BT-3	Applying
21.	List the assumptions made in yield line analysis of slabs.	BT-1	Remembering
22.	Define yield line theory	BT-1	Remembering
23.	State the principle of virtual work.	BT-1	Remembering
24.	Explain the concept of yield line method?	BT-4	Analyzing
25.	What is the direction of yield line in two way slab?	BT-2	Understanding
	PART B		
1.	An exterior panel of a flat slab floor is 6m x 6m along column center lines. Live load on floor is 3kN/m^2.Supporting column diameter is 500 mm. Choosing the thickness of the slab (from stiffness criteria) and appropriate dimensions for column head and drops, Examine the design moments and shear forces. Use direct design method	BT-1	Remembering
2.	Explain the following in Detail. i. Yield line theory ii. Equilibrium work method iii. Virtual work method	BT-5	Evaluating
3.	An interior panel of a flat slab floor is 6m x 6m along column center lines. Live load on floor is 3kN/m^2.Supporting column diameter is 500 mm. Choosing the thickness of the slab (from stiffness criteria) and appropriate dimensions for column head and drops, Examine the design moments and shear forces. Use direct design method.	BT-1	Remembering
4.	Calculate the reinforcement and design of square slab for a live load of 5kN/m^2 Show the reinforcement details in the Square slab. Use M20 concrete and Fe415 steel. Assume Suitable datas.	BT-4	Analyzing
5.	Identify the ultimate load for isotropic of the following profiles simply supported on all edges carrying distributed load throughout the slab. (a) Square slab and (b) Circular slab	BT-1	Remembering
6.	Explain the following about flat slab: (a) Types of flat slab (b) Panel divisions (c) Direct design method (d) Equivalent frame method	BT-2	Understanding
7.	A square interior panel of an intermediate floor is of effective dimension 5 m x 5 m. The live load on the floor is 2.5 kN/$m^{2.}$ Finishes is 1 kN/$m^{2.}$ Analyse the slab using yield line approach and design the slab. Use M20 concrete and Fe 415 steel.	BT-4	Analyzing
8.	Explain the Guidelines for design of Square slab &Rectangular slab with different boundary conditions subjected to UDL and concentrated loads	BT-3	Applying

9.	Design a circular slab of 4.5 meter diameter, simply supported along the edges, to carry a service load of 5 kN/m^2. Adopt M20 Grade concrete and Fe 415 Grade steel. Use yield line method for analysis.	BT-6	Creating
10.	Calculate the ultimate load carrying capacity of a 4 m x 6 m slab continuous on all edges if yield moments are 25 kN m/m for positive and negative moments respectively, they being uniformly loaded.	BT-3	Applying
11.	Explain step by step for design of RC Spandrel beam in detail.	BT-2	Understanding
12.	Explain Hillerborg's simple strip method of analysis	BT-2	Understanding
13.	An interior panel of a flat slab floor is 4.5m x 4.5m along column centre lines. Live load on floor is 4kN/m^2.Supporting column diameter is 450 mm. Choosing the thickness of the slab (from stiffness criteria) and appropriate dimensions for column head and drops, Examine the design moments and shear forces. Use direct design method.	BT-1	Remembering
14.	A square interior panel of an intermediate floor is of effective dimension 3 m x 3 m. The live load on the floor is 2 kN/m^2. Finishes is 1.5 kN/m^2. Analyse the slab using yield line approach and design the slab. Use M25 concrete and Fe 415 steel.	BT-4	Analyzing
	PART C		
1.	Estimate the dimensions of a flat slab system (with drops) for a four storey building with 5 spans of 8 m in the longer direction, 5 spans of 6 m in the shorter directions and a storey height of 3m.	BT-5	Evaluating
2.	Design a simply supported slab of size 4m by 3m using yield line theory. The slab is subjected to a live load of 3.5kN/m^2.And floor finish of 1.5kN/m^2. . Use M20 &Fe415.using Hillerborg's pattern	BT-6	Creating
3.	Explain the methods available for analysis of flat slab in detail.	BT-2	Understanding
4.	Enumerate from principles the ultimate design moments for a rectangular simply supported slab panel using yield line approach. Hence the design moments for a simply supported rectangular slab 3 m x 4 m effective, subjected to a live load (working) of 2.5 kN/m^2 and finish of 1 kN/m^2. Assume suitable load factor	BT-1	Remembering
	UNIT IV DESIGN OF CONNECTIONS Types of connections – Welded and Bolted – Throat and Root Stresses in Fillet Welds – Seated Connections – Unstiffened and Stiffened seated Connections – Moment Resistant Connections – Clip angle Connections – Split beam Connections – Framed Connections HSFG bolted connections		
1.	Explain moment connections	*BT-6*	Creating
2.	Draw the moment rotation curve for different types of connections	*BT-3*	Applying
3.	Define un-stiffened seat connections	*BT-1*	Remembering
4.	Explain stiffened seat connections	*BT-4*	Analysing
5.	What is bracket connection?	*BT-1*	Remembering
6.	Classify the types of bracket connections explain with neat sketch.	*BT-4*	Analysing

7.	Discuss the examples for connections subjected to eccentric shear.	*BT-2*	Understanding
8.	Illustrate the types of heavy moment connections?	*BT-2*	Understanding
9.	What are split beam connections?	*BT-1*	Remembering
10.	Draw the sketch of split beam connections	*BT-3*	Applying
11.	Describe bolted bracket connections with a neat sketch.	*BT-2*	Understanding
12.	Compose some examples for light moment connections	*BT-5*	Evaluating
13.	Rewrite the formula for finding the bearing length of seat angle in the beam to column connection?	*BT-5*	Evaluating
14.	Write the formula for finding the moment of resistance of clip angle	*BT-1*	Remembering
15.	Explain how you will determine the diameter of the bolt hole.	*BT-4*	Analysing
16.	Describe the advantages and disadvantages of bolted connections.	*BT-2*	Understanding
17.	Classify various types of bolts used for structural purposes?	*BT-3*	Applying
18.	List the categories of imperfections in welding.	*BT-1*	Remembering
19.	Explain the stiffened seat connection with a sketch	*BT-6*	Creating
20.	What are shear connections?	*BT-1*	Remembering
21.	Establish the terms slip factor and prying action.	BT-4	Analyse
22.	Classify the types of bolts used for structural purposes?	BT-3	Apply
23.	Compare the advantages of welded connection over bolted connection.	BT-2	Understand
24.	Recommend the limit states of serviceability applicable to steel structures?	BT-6	Create
25.	Establish the terms slip factor and prying action.	BT-4	Analyse
1.	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 shown in the figure. The steel used is of grade Fe410. Use bolts of grade 4.6. The thickness of bracket plate may be taken as 10mm.  	*BT-5*	Evaluating

2.	(i) Describe and design a bracket connection to transfer an end reaction of 225kN due to factored loads as shown in the fig. The end reaction from the girder acts at an eccentricity of 300mm from the face of the column flange. (ii) Also design bolted joint connecting the Tee flange with the column flange. Steel is of grade Fe410 and bolts of grade 4.6. 	*BT-1*	Remembering
3.	A bracket plate 10 mm thick is used to transmit a reaction of 100 kN at a distance of 125mm from column flange as shown in fig. Design the Bolted connection .Draw design details. 	*BT-3*	Applying
4.	(i) Briefly explain the difference between bolted and welded connections (ii) Distinguish the following: a) Factor of safety and partial factor for loads b) Characteristics loads and design loads	*BT-4*	Analysing
5.	Discuss and design a single unequal angle strut to carry a load of 90 kN. The angle is connected by its longer leg to 8 mm thick gusset plate. The effective length of the member is 2.5 m. Also design the plate bolted end connections.	*BT-2*	Understanding
6.	An ISLB 325 @ 43.1 kg/m transmit an end reaction of 125 kN to the web of ISHB 300@ 63 kg/m. Design the bolted connection. Draw the design details.	*BT-3*	Applying
7.	A ISMB 500@ 0.869 kN/m transmits an end reaction of 130 kN to the flange of column ISHB 250@ 0.510 kN/m. Design an un-stiffened bolted seat connection.	*BT-5*	Evaluating
8.	An ISMB300, @ 0.442 kN/m transmits an end reaction of 11 kN and an end moment of 80kNm to the flange of a column ISHB300, @ 0.630 kN/m. Identify and design the welded/bolted connections.	*BT-1*	Remembering

9.	An ISLC300@324.7N/m (Fe410 grade of steel) is to carry a factored tensile force of 900kN. The channel section is to be welded at the site to a gusset plate 12mm thick. Summarize and design a bolt connection, if the overlap is limited to 350mm.	*BT-2*	Understanding
10.	Design and discuss about strut of single unequal angle to carry a load of 100 kN. The angle is connected by its longer leg to 10 mm thick gusset plate. The effective length of the member is 2 m.	*BT-2*	Understanding
11.	Calculate the of a 20mm diameter bolt of grade 4.6 for the following connections. The main plates to be jointed are 12mm thick (i) Lap joint (ii) Single cover butt joint the cover plate being 10mm thick (iii) Double Cover joint .each of the cover plate being 8mm thick. Assume suitable datas.	*BT-6*	Creating
12.	(i) Give examples for light moment connection (ii) Design a split beam connection to transfer a factored shear 150KN and a moment of 50KNm from the end of the beam ISMB 350 to a column of ISHB 300 use 16mm dia bolts.	*BT-4*	Analysing
13.	(i) Explain the two main types of moment-resistance connections? (ii) Explain (a)Split-T beam Connection (b) Column spice & beam Spice	*BT-6*	Creating
14.	Write Short Notes on (i) Unstiffened seat angle connection (ii) Stiffened seat angle connection (iii) Framed Connection	*BT-1*	Remembering
	PART C		
1.	Two flats , of Fe410 grade steel, each 210mmx 8mm are to be jointed using 20mm diameter, 4.6 grade bolts, to form a lap joint. The joint is supposed to transfer a factored load of 250kN. Justify and design the joint and determine suitable pitch for the bolts.	*BT-1*	Remembering
2.	Two plates 10mm and 18mm thick are to be joined by double cover butt joint. Summarize and design the joint for the following data. Factored design load: 750kN Bold diameter: 20mm Grade of steel: Fe410 Grade of bolts: 4.6 Cover plates 2 (one on each side): 8mm thick	*BT-6*	Creating
3.	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 joints, if 4 bolts are provided in the bolt line at a pitch of 45mm. Also determine the efficiency of the joint if two lines of bolts with 2 bolts in each line have been arranged to result in a double-bolted double-cover butt joint.	*BT-4*	Analysing

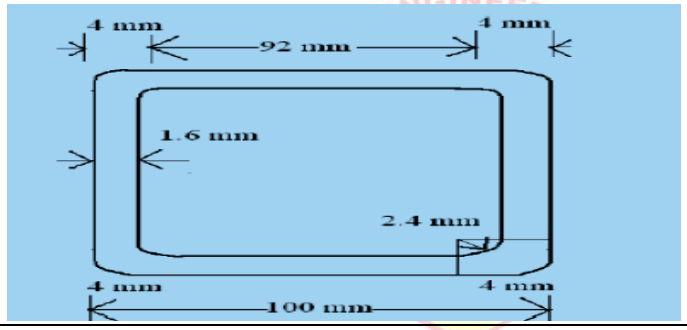
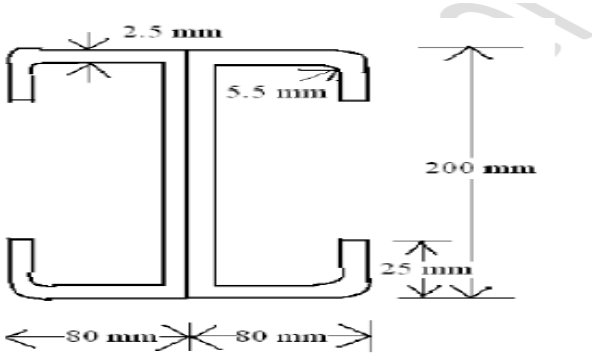
4.	A 120mm diameter and 6mm thick pipe is fillet welded to a 14mm plate. It is subjected to a vertical factored load of 4.5kN at 1m from the welded end and a factored twisting moment of 1.8kNm. Examine and design the joint assuming shop welding and steel of grade fe410.	*BT-1*	Remembering

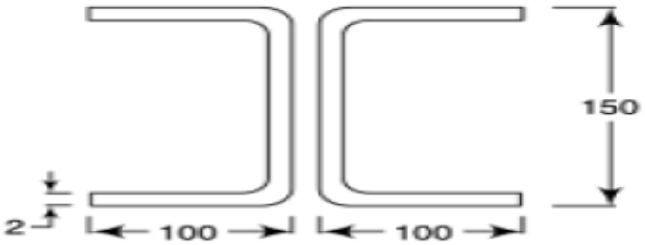
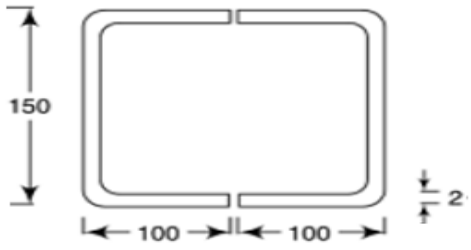
UNIT V- DESIGN OF LIGHT GAUGE STEEL STRUCTURES

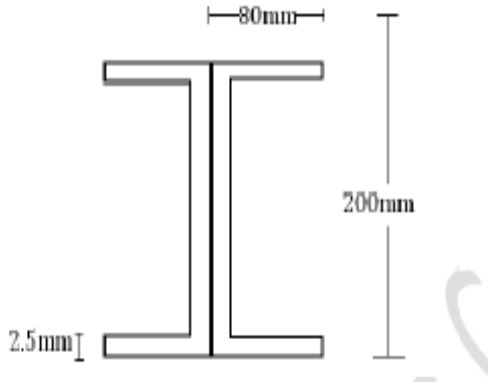
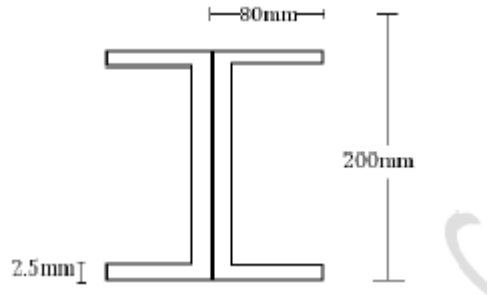
Introduction to Direct Strength Method - Behaviour of Compression Elements - Effective width for load and deflection determination – Behaviour of Unstiffened and Stiffened Elements – Design of webs of beams – Flexural members – Lateral buckling of beams – Shear Lag – Flange Curling – Design of Compression Members – Wall Studs.

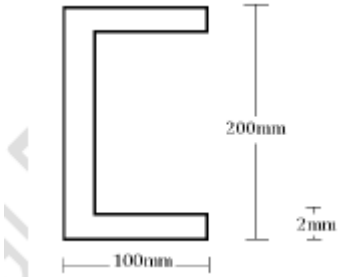
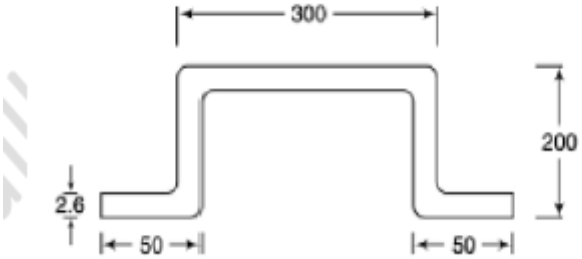
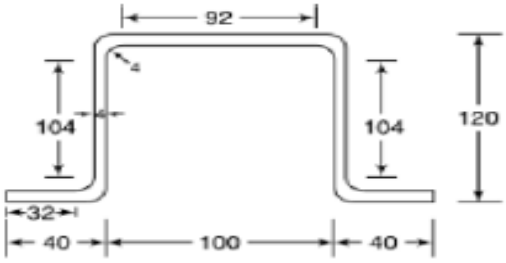
PART - A

Q.No	Questions	BT Level	Competence
1.	What are light gauge steel structures?	*BT-1*	Remembering
2.	Discuss the uses of light gauge steel structural members.	*BT-2*	Understanding
3.	Explain the codal provisions available for the design of light gauge steel structural members.	*BT-4*	Analysing
4.	Draw the various section available in light gauge steel structural members.	*BT-3*	Applying
5.	Discuss about stiffened compression elements with neat sketches	*BT-2*	Understanding
6.	Explain unstiffened compression elements.	*BT-4*	Analysing
7.	What is the significance of shear lag?	*BT-1*	Remembering
8.	Illustrate flat-width ratio.	*BT-3*	Applying
9.	What is effective design width?	*BT-1*	Remembering
10.	Explain local buckling.	*BT-4*	Analysing
11.	Write the maximum allowable flat to width ratio for various elements as per IS801:1975.	*BT-5*	Evaluating
12.	Illustrate shear lag.	*BT-3*	Applying
13.	Discuss about the torsional buckling.	*BT-2*	Understanding
14.	What is point symmetric section?	*BT-1*	Remembering
15.	Discuss the bending stress distribution diagram at different stages of loading with neat sketches?	*BT-2*	Understanding
16.	Write the formula for finding the b/t ratio for load determination.	*BT-1*	Remembering
17.	Rewrite the formula for finding the b/t ratio for deflection determination.	*BT-5*	Evaluating
18.	What is flange curling?	*BT-1*	Remembering
19.	What are cold-formed steel structures?	*BT-1*	Remembering
20.	Explain effective width calculation in light gauged steel sections.	*BT-6*	Creating
21.	Define Wall Studs	*BT-1*	Remembering
22.	List the various types of compression members?	BT-1	Remember
23.	What do you mean by web buckling?	BT-1	Remember
24.	Classify the modes of failure in compression member.	BT-3	Apply

25.	Define effective length of a column.	BT-1	Remember
	PART - B		
1.	Two channels with 200mm x 800mm with bent lips are connected with webs to act as a beam. The thickness of the plate is 2.5mm and the depth of lip is 25mm. the beam has an effective span of 4m. Formulate the equations and determine the allowable load on the beam and also find the deflection at the allowable load. The yield stress of steel is 235N/mm^{2}and E=2 ×10^{5}N/ mm^2	*BT-5*	Evaluating
2.	Illustrate the following with sketches with reference to light-gauge sections (i)Stiffened and unstiffened compression elements (ii)Flat-width ratio (iii)Effective design width (iv)Torsional flexural buckling (v)Point symmetric section	*BT-3*	Applying
3.	Calculate the column section properties and allowable load for the column section shown in fig below. The effective length of the column is 3.2 m. Take f y= 235 N/mm^2 	*BT-3*	Applying
4.	Two channel 200 mm × 80 mm with bent lips are connected with webs to act as beam as shown. The thickness of plate is 2.5 mm and the depth of lip is 25 mm. The beam has an effective span of 4 m. Determine the allowable load per meter on the beam. Also, determine the deflection at the allowable load. The steel has a yield point of 235 N/mm^2. Take E=2 ×10^{5}N/mm^2. 	*BT-4*	Analysing
5.	(i)Summarize the merits and demerits of cold from light gauge steel section. (ii)Also enlist and draw the different sections used in cold from steel.	*BT-6*	Creating

6.	Identify and determine the allowable load per metre on the beam as shown below. Also, determine the deflection at the allowable load. The length of the column is 3.1m. the two sections are joined together by spot welding. The steel has a yield point of 235N/mm^2. Take E = 2 ×10^5 N/mm^2. 	*BT-1*	Remembering
7.	Identify and compute the allowable load on the light gauge steel beam as shown below: 	*BT-1*	Remembering
8.	Discuss the following: a) Lateral torsional buckling b) Shear lag c) Effective design width d) Light gauge steel	*BT-2*	Understanding
9.	Describe and determine the allowable load per metre on the composite section beam as shown below. Also, determine the deflection at the allowable load. The length of the column is 3.0m. The two sections are joined together by spot welding. The steel has a yield point of 235 N/ mm^2. Take E:2 ×10^{5}MPa. 	*BT-1*	Remembering
10.	Estimate the allowable load on the light gauge steel beam of channel section with a lip . The width of web:300mm;Width of lip:50mm;Width of flange:200mm;Thickness of section: 2.6mm	BT-5	Evaluating
11.	Design a Stanchion 3.5 m long in a building subjected to a factored load of 550 kN both the ends of a stanchion are effectively restrained in direction and position. Use steel of grade Fe410	*BT-6*	Creating

12.	A steel supported joist with a 4.0 m effective span of UDL of 50 kN over its span inclusive of its self weight .the beam is laterally supported throughout. Design the beam using working stress method steel of grade is Fe410.	*BT-6*	Creating
13.	Two channel 200 mm × 80 mm with bent lips are connected with webs to act as beam as shown. The thickness of plate is 2.5 mm . The beam has an effective span of 4.5 m. Estimate the allowable load per metre on the beam. 	*BT-2*	Understanding Understanding
14.	Describe in detail about the following: (i)Lateral buckling of beams (ii)Compression member (iii)Flange Curling (iv)Wall Studs.	*BT-2*	Understanding
	PART C		
1.	Two channel 200 mm × 80 mm with bent lips are connected with webs to act as beam as shown. The thickness of plate is 2.5 mm . The beam has an effective span of 4.5 m. Estimate the allowable load per metre on the beam. 	*BT-2*	Understanding

2.	Formulate the equations and determine the allowable load per metre on the beam as shown below. Also, determine the deflection at the allowable load. The length of the column is 3.2m. The steel has a yield point of 235 N/ mm^2. Take E = 2 $\times 10^5$ N/mm^2.  	*BT-5*	Evaluating
3.	Identify and compute the allowable load on the light gauge steel beam as shown below:  	*BT-1*	Remembering
4.	A top chord member of a roof truss is of hat section as shown in the fig. It is subjected to a compression of 132.5kN and a moment of 1636 kNm. The span is 1.7m.Check the safety of the section if fy=210N/mm^2.  	*BT-4*	Analysing