INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

CIVIL ENGINEERING

TUTORIAL QUESTION BANK

Course Name	:	**ADVANCED STEEL DESIGN**
Course Code	:	**BST006**
Class	:	I M Tech II Semester
Branch	:	CE (STRUCTURAL ENGINEERING)
Year	:	2017 – 2018
Course Coordinator	:	Gude Ramakrishna, Associate Professor, Department of CE
Course Faculty	:	Gude Ramakrishna, Associate Professor, Department of CE

I. COURSE OBJECTIVES

The course should enable the students to:

I	Describe the basic principles bolted, welded and riveted connections
II	Analyse beam-column connections and design the roof systems subjected to wind action
III	Design beam, column, and frame bracing to provide structural stability
IV	Understand and apply the design procedure of steel bridges, bunker and silos as per Indian standard codal provisions

II. COURSE LEARNING OUTCOMES

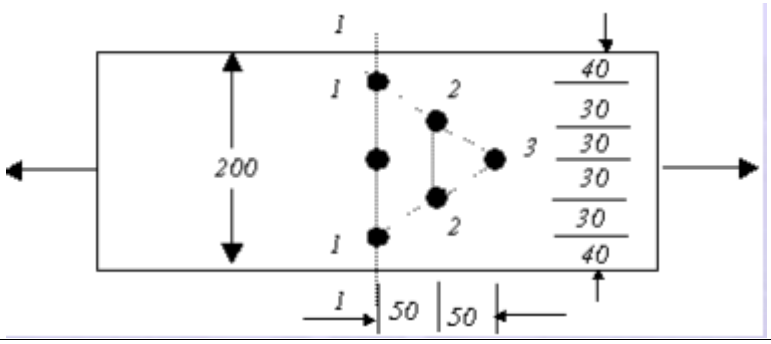
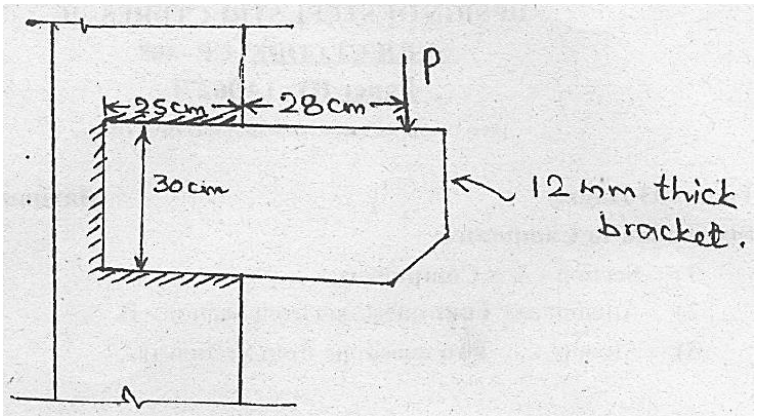
Students, who complete the course, will have demonstrated the ability to do the following:

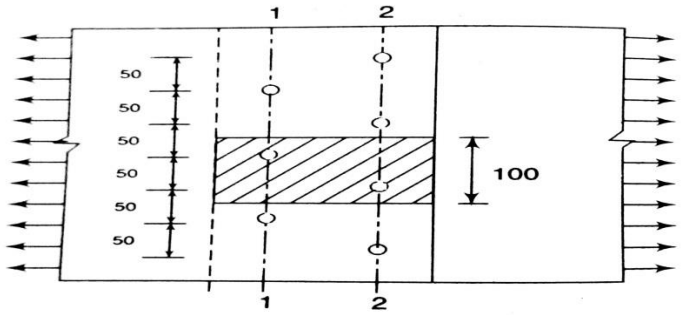
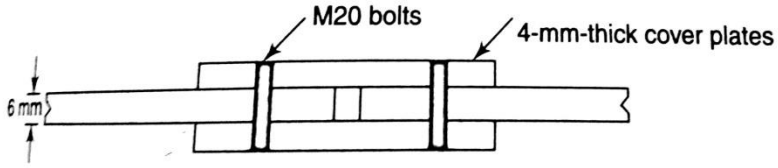
1	Calculate the load transfer and failure of bolted joints
2	Explain riveted connection, bolted connections, load transfer mechanism
3	Identify the types fo connections, tensile strength of plate, strength and efficiency of the joint
4	Find the combined shear and tension, slip, critical connections, praying action, combined shear and tension for slip
5	Design of groove welds, design of fillet welds, design of intermittent fillet welds, failure of welds
6	Explain the importance beams, column connections, connections subjected to eccentric shear
7	Calculate the bolted framed connections, bolted seat connections
8	Calculate the bolted moment connections, welded framed connections
9	Calculate welded bracket connections
10	Analyze the moment resistant connections in columns
11	Analyze Dead loads, live loads and wind loads on roofs
12	Design wind speed and pressure, wind pressure on roofs

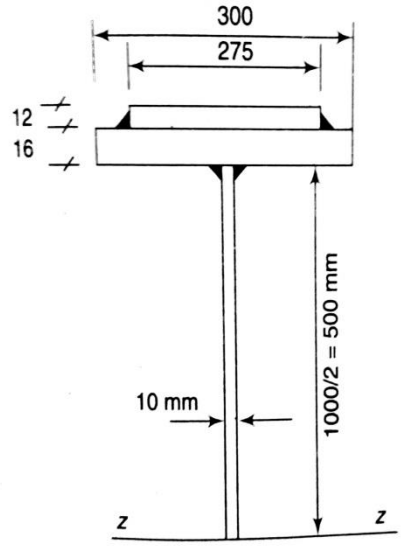
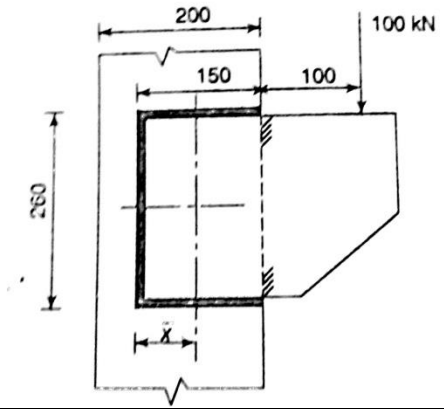
13	Understand design of angular roof truss, tubular truss, truss for a railway platform
14	Design of purlins for roofs, design of built up purlins
15	Design of knee braced trusses and stanchions Design of bracings
16	Types of truss bridges, component parts of a truss bridge
17	Determining the economic proportions of trusses, self-weight of truss girders
18	Design of bridge compression members, tension members;
19	Calculate wind load on truss girder bridges; wind effect on top lateral bracing
20	Explain about portal bracing; sway bracing
21	Jansen's theory, airy's theory, design of parameters
22	Design criteria, analysis of bins, hopper bottom and design of bins
23	Posses the Knowledge and Skills for employability and to succeed in national and international level competitive examinations

S No	QUESTION	Blooms taxonomy level	Course Outcomes
	UNIT-I **SIMPLE CONNECTIONS –RIVETED, BOLTED PINNED AND WELDED CONNECTIONS**		
Part - A (Short Answer Questions)			
1	List the various types of connections used for connecting the structural members?	Remembering	1
2	Formulate to calculate the efficiency of a joint?	Remembering	1
3	Formulate the equation for calculating the effective throat thickness of weld?	Remembering	1
4	List the types of failures occur in riveted joint?	Remembering	1
5	Define riveting?	Remembering	1
6	Define staggered pitch?	Remembering	2
7	Differentiate nominal diameter and gross diameter of bolt	Remembering	5
8	List the various types of welded joints	Remembering	5
9	Illustrate the advantages of HSFG bolts?	Remembering	5
10	Define the terms gauge, pitch, edge and end distance of bolt joint	Understanding	5
11	Classify the types of bolts used for structural purposes?	Remembering	3
12	Recommend the four types of serviceability limit states applicable to steel structures?	Remembering	3
13	Discuss the factors to be considered in mechanical properties of structural steel?	Remembering	3
14	Arrange the double riveted lap joint with neat sketch	Remembering	3
15	Compare the high tension bolt from common black bolt?	Remembering	3
16	Differentiate Lap joint and Butt Joint	Understanding	3
17	Recommend about minimum pitch and maximum pitch	Understanding	3
18	Compare the advantages of welded connection over bolted connection	Understanding	3
19	Define Prying Action	Understanding	3
20	What are eccentrically loaded connections?	Understanding	4

Part - B (Long Answer Questions)			
1	Two plates 10 mm and 20 mm thick are connected by double cover butt joint made of 8mm cover plate Find the strength of the joint If 6 numbers of M20 bolts of grade 46 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	Applying& Analyzing	4
2	Identify the number of bolts required for a lap joint between two plates of size 100mm x 16mm and 100mm x 12mm thick so as to transmit a factored load of 120 kN using a single row of M20 bolts of grade 46 and grade 410 plates	Applying& Analyzing	4
3	Discuss the types of load to be account for steel design?	Understanding	4
4	Distinguish between (i) Factor of safety and partial factor for loads (ii) Characteristics loads and design loads	Understanding	4
5	A single bolted double cover butt joint is used to connect two plates 8mmthick Assuming 20mm bolts at 50mm pitch examine the efficiency of the joint The thickness of cover plate is4mm	Applying& Analyzing	4
6	Explain prying forces with neat figures	Understanding	4
7	What if the Two plates 16mm are joined using (i) Lap joints (ii) Butt joints using 10mm cover plates made with M20 HSFG of grade 88 with coefficient of friction =048 prepare the bolt value	Applying	4
8	A bridge truss carries an axial pull of 400 KN It is to be a gusset plate22mm thick by a double cover butt joint with 22 mm diameter power driven rivets Design an economical joint Determine the efficiency of the joint	Applying	4
9	Design a double riveted cover butt joint to connect 2 plates of 12mm thick Adopt power driven rivets Take fy = 250MPa Find also the efficiency of the joint	Applying	4
10	A member of a truss consists of two angles ISA 75x75x6 placed back to back It carries an ultimate tensile load of 150kN and is connected to a gusset plate 8mm thick placed in between the two connected legs Determine the number of 16mm diameter 46 grade ordinary bolts required for the joint Assume fu of plate as 410MPa	Applying	4
11	What is meant by strength of bolted connections? How is it calculated?	Understanding	4
12	Write short notes on (any two) : (a) SwayBracings (b) Rocker Bearings (c) Disadvantages of Riveted Connections	Understanding	4
13	Explain the weld defects	Understanding	4

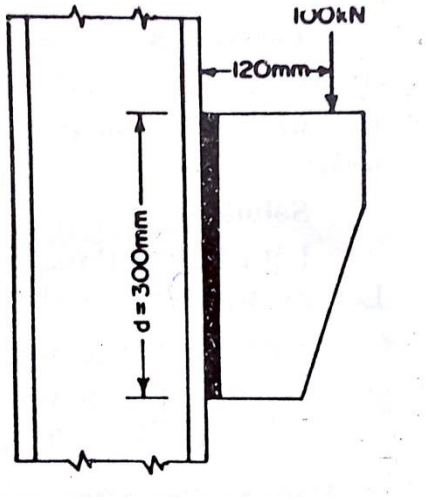
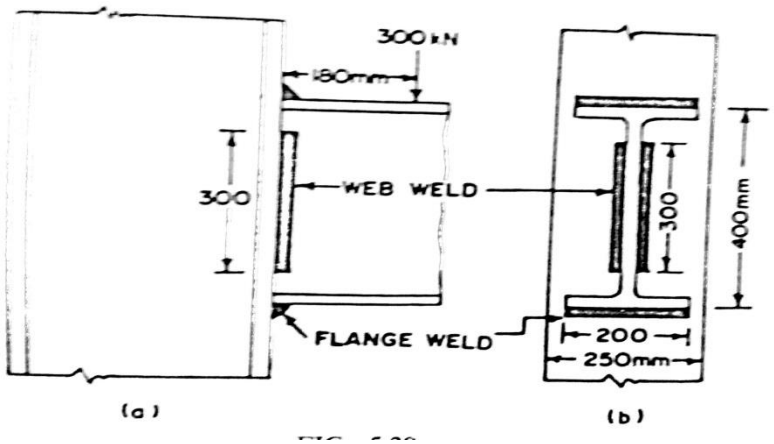
14	Determine the desig tensile strength of the plate (200 X 10 mm) with the holes as shown below, if the yield strength and the ultimate strength of the steel used are 250 MPa and 420 MPa and 20 mm diameter bolts are used fy = 250 MPa fu = 420 MPa 	Applying	4
15	List specifications for the design of riveted joint	Understanding	4
16	Write about different types of failure of bolted joints with the help of figures	Understanding	4
Part - C (Problem Solving and Critical Thinking Questions)			
1	Design a Lap joint between plates 100? 8 so as to transmit a factored load of 100 kN using black bolts of 12mm diameter and grade 46 The plates are made of steel of grade ST-42-S	Analyze & Evaluate	4
2	Design a hanger joint along with an end plate to carry a downward load of 2T = 330 kN Use end plate size 240 mm x 160 mm and appropriate thickness and 2 nos of M25 Gr88 HSFG bolts (fo = 565 MPa)	Analyze & Evaluate	4
3	Determin~ the maximum load 'P', which can be applied on bracket plate with 8 mm fillet weld 	Analyze & Evaluate	4
4	A load of 150 kN is applied to a bracket plate at an eccentricity of 300 mm sixteen rivets of 20 mm nominal diameter are arranged in two rows with 8 rivets per row The two rows are 200 mm apart and the pitch is 80 mm if the bracket plate is 125 mm thick, investigate the safety of the connection Given, s = 100 N/mm2,fb = 300 N/mm2 and ft = 150 N/mm2	Analyze & Evaluate	5

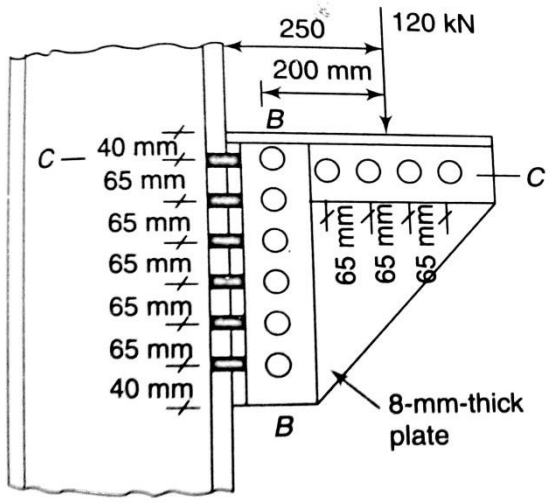
5	Calculated the efficiency of a zig-zag double bolted lap joint as in figure Assume Fe410 grade plate and grade 46 bolts of diameter 20mm and 8mm thick plates 	Analyze & Evaluate	5
6	A single bolted double cover butt joint is used to connect two plates 6mm thick Assuming the bolts of 20mm diameter at 60mm pitch calculate the efficiency of the joint Use 410MPa plates and 46 grade bolts 	Analyze & Evaluate	5
7	The plates of a 6mm thick tank are connected by a single bolted lap joint with 20mm diameter bolts at 60mm pitch Calculate the efficiency of the joint Take fu of plate as 410 MPa and assume 46 grade bolts	Analyze & Evaluate	5
8	A tie member of a truss is made of ISA 65 x 65 x 6 and subjected to a factored load OF 90KN The length of the angle is not enough to go from end to end and hence a splice has to be provided Design a groove weld joint	Analyze & Evaluate	5
9	Design a butt joint to connect two plates 175x10mm Fe10 grade using M20 bolts Arrange the bolts to give maximum efficiency	Analyze & Evaluate	5
10	Design a connection to joint two plates of size 250x12mm of grade Fe410, to mobilize full plate tensile strength using shop fillet welds, if a) A lap joint is used b) A double cover butt joint is used	Analyze & Evaluate	5

11	Design a suitable fillet weld to connect the web plate to the flange plate and the flange plate to the cover plate of the compression flange of aplate girder as shown in figure The size of the web plate is 1000mmx10mm The flange and cover plate are of the dimensions 300x16mm and 274x12mm, respectively The maxi factored shear force V= 800kN Assume shop welding  	Analyze & Evaluate	5
12	A bracket plate is welded to the flange of a column ISHB200 as in figure Calculate the size of the weld required to support a factored load of 100kN  	Analyze & Evaluate	5
13	Two plates of thickness 12mm and 10mm are to be jointed by a groove weld The joint is subjected to a factored tensile force of 275kN Assuming an effective length of 150mm, check the safety of the joint for: a) Single V groove weld joint b) Double V groove weld joint	Analyze & Evaluate	5
14	The diagonal of a bridge truss is 16mm thick flat and has to transmit a pull of 600kn The diagonal is to be connected to 16mm thick gusset plate by a double cover butt joint with 20mm rivets Calculate the number of rivets and width of flat required Take permissible stresses as follows: σ_{at}= 150N/mm^2; τ_{vf}= 100N/mm^2 and σ_{pf}= 300N/mm^2 Sketch the joint and calculate the efficiency of the joint	Analyze & Evaluate	5

15	Determine the load which can be transmitted per pitch length of a double cover butt joint connected by 24mm diameter shop rivets at 100mm pitch The thickness of the main plates and cover plates are 16mm and 12mm respectively Take allowable tensile strength of plates equal to 150N/mm^2, allowable shear in rivets equal to 100N/mm2 and allowable stress in bearing for rivets equal to 300N/mm2 Also determine the efficiency of the joint	Analyze & Evaluate	5
16	Determine the rivet value of 20mm diameter rivets connecting 12mm thick plates, if it is in (a) single shear (b) double shear The permissible stress for rivet in shear and bearing are 80N/mm2 and 250N/mm2 and for plate in bearing is 250N/mm2	Analyze & Evaluate	5
	UNIT-II **ECCENTRIC AND MOMENT CONNECTIONS**		
Part - A (Short Answer Questions)			
1	What are beam-columns?	Remembering	6
2	Draw typical sketch of Framed connection	Remembering	6
3	A bracket is connected to the flange of a column by complete penetration butt weld How you will calculate equivalent stress?	Remembering	6
4	List various failure modes of beam	Remembering	6
5	Explain methods to make the beam Laterally restrained	Understanding	6
6	How are bending moments introduced in columns?	Understanding	6
7	What are the parameters that affect the behaviour of beam-columns?	Understanding	6
8	What are the different steps followed while designing a beam-column?	Understanding	6
9	What is the equation for calculating the reduced effective moment for beam-columns subjected to tension and bending moments?	Understanding	6
10	Explain block shear failure with figures	Understanding	6
11	What is a bracket connection?	Understanding	6
12	How is the beam-to-beam connection designed?	Understanding	6
13	What do you mean by beam splice?	Understanding	6
14	How are connections classified?	Understanding	6
15	What is the difference between unstiffened and stiffened seat connection?	Understanding	6
Part - B (Long Answer Questions)			
1	Design a simply supported beam of span 6m carrying a reinforced concrete floor capable of providing lateral restraint to the top compression flange The total UDL is made up of 80 kN dead load including self-weight plus 120 kN imposed load Assume Fe410 grade steel	Analyze & evaluate	7
2	Explain section classification based on moment- rotation characteristics	Understanding	8
3	Design a laterally unstrained beam simply supported over a span of 73m It carries a UDL 756 kN/m assume Fe 410 grade steel)	Applying	7
4	) Determine the design axial load on the column is 5m and it is pinned Assume steel grade Fe 410, f_y = 250N/mm^2	Applying	7
5	Write on design of laterally unsupported beam	Understanding	8
6	Design a beam to span 5m carrying a load of 5kN/m inclusive of self-weight The ends of the beam are unstrained against lateral bending Take f_y = 235 N/mm^2	Applying	7

7	Design a simply supported beam of 5 m span to carry total factored load of 45 kN/m (including self-weight) The compression flange of the beam is laterally restrained throughout Check for design shear strength, design bending strength and deflection	Applying	7
8	What are the different types of beam column connections?	Understanding	8
9	An ISLB 400 @ 569 kg/m transmits an end reaction of 150kN to the flange of a stanchion ISHB 250 @51kg/m Design a double fillet welded web connection made in the field	Applying	7
10	Two secondary beams ISMB 400 @616 kg/m transmits a reaction of 225kN to either side of a girder ISMB 600@ 1226kg/m Design double fillet shop welded web connection	Applying	7
11	An ISLB 400 @ 569 kg/m transmits an end reaction of 150kN to the flange of a stanchion ISHB 250 @51kg/m Design a fillet welded double plate framed connection using welds (A) as Shop welds and welds (B) as field welds	Applying	8
12	A beam ISMB 500 @ 8696kg/m transmits an end reaction of 250kN to the web of a column ISHB 300@63kg/m Design a stiffened welded seat connection using field welds	Applying	7
13	A beam ISMB 450 @ 724 kg/m transmits a shear of 150kN and a moment of 130kNm to the flange of a steel column ISHB 400 @ 822kg/m Design the suitable beam column shop welded connection	Applying	7
14	Explain moment resistant welded connections for continuous beams with suitable figures	Understanding	8
15	A beam ISMB 400 @ 616 kg/m transmits an end shear of 150kN to the flange of a stanchion ISHB 300 @ 588 kg/m Design an un-stiffened welded seat connection using shop welds	Analyze & evaluate	8
16	A beam ISMB 500 @ 1037 kg/m transmits an end reaction of 200kN and end moment of 160kNm to a column ISHB 400 @ 828 kg/m Design a bracketed connection	Analyze & evaluate	8
Part - C (Problem Solving and Critical Thinking Questions)			
1	A non – sway intermediate column in a building frame with flexible joints is 40 m high and it is ISHB 300 @ 588 N/m steel section Check the adequacy of the section when the column is subjected to following load:	Analyze & evaluate	9
2	Design a member (beam - column) of length 50M subjected to direct load 60T (DL) and 50T (LL) and bending moments of Mzz {36TM (DL) + 25TM (LL)} and Myy {055TM (DL) + 034TM (LL)} at top and Mzz {50TM (DL) + 34TM (LL)} and Myy {06TM (DL) + 036TM (LL)} at bottom	Analyze & evaluate	9
3	Suggest & design beam-column welded connection for ISMB500 & ISSC200 to carry 120 KNm BM & 100KN shear	Analyze & evaluate	9
4	Analyse the beam ABC of length 5m propped cantilever at end C & Fixed at end A The cantilever is loaded by load w at B which is 2m from C for AB portion the plastic moment of resistance is 2 Mp while for BC it is Mp Determine collapse load	Analyze & evaluate	9
5	A plate bracket carrying a load of 150 K N at an eccentricity of 100 mm, Is connected to flange of] section Determine the size of filled weld The Depth of bracket is 300mm at the member face The weld is applied on both sides of bracket	Analyze & evaluate	9

6	A simply supported beam of span 50 meter is subjected to a superimposed load of 30 kN per meter over entire span and a concentrated load of 200 kN at mid span Design the beam and check for deilection and shear The beam is laterally supported throughout	Analyze & evaluate	10
7	Design a column to support a factored load of 1050 kN The column has an effective length of 7m with respect to z- axis and 5m with respect to y-axis Use steel grade Fe410	Analyze & evaluate	10
8	A plate bracket, carrying a load of 100kN at an eccentricity of 120mm, is connected to the face of a steel stanchion by fillet welds on both sides of the plate, as in figure Determine the size of the fillet weld a) If 8mm fillet weld is used determine the depth of the bracket b) If 8m fillet weld is used with a bracket of 250mm depth calculate the resulting stress in the weld 	Analyze & evaluate	10
9	A bracket of I section is welded to a steel stanchion , by using flange welds as well as web welds as shown in figure The size of the flange welds arte double the size of web welds Determine suitable weld size, taking a permissible shear stress of 110N/mm2 I n the welds 	Analyze & evaluate	10

10	Design a bracketed bolt connection to transfer a factored load of 120kN as shown in figure 74.  	Analyze & evaluate	10

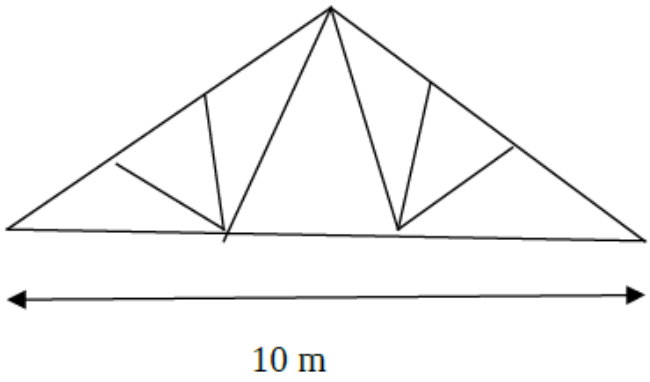
UNIT-III
ANALYSIS AND DESIGN OF INDUSTRIAL BUILDINGS

Part - A (Short Answer Questions)

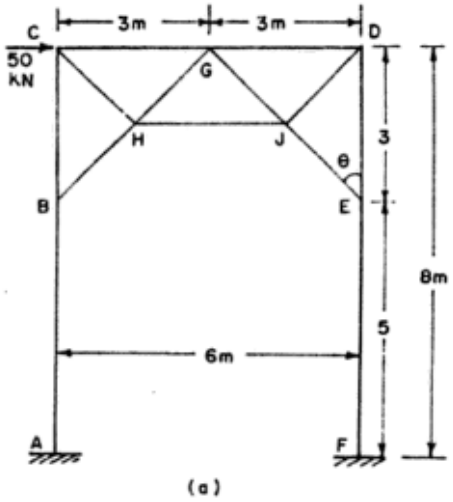
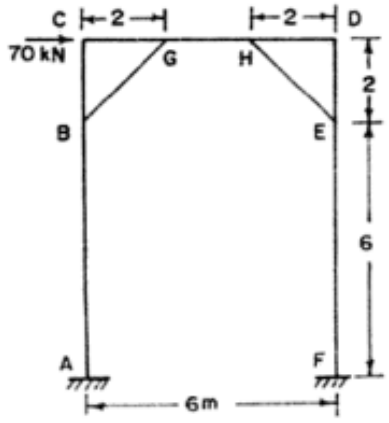
1	List the elements of an industrial building	Understanding	11
2	Mention the design steps for channel or I section purlins	Understanding	11
3	For analysis of industrial building bents for columns hinged at base, what is the assumption normally made	Understanding	11
4	State advantages & disadvantages of tubular sections in steel structure	Remembering	11
5	Write note on design considerations as per IS code for tubular structure used as scafoulding	Remembering	11
6	Compare the hollow circular & hollow square section as thin' thin tubular sections, for its strength with respect to use as compression member	Remembering	11
7	State the difference between purlin and grit	Understanding	11
8	What are ther sections normally used as purlins and grits?	Understanding	11
9	What are wind columns?	Understanding	11
10	What are the functions of an eave strut?	Understanding	11
11	How can one determine whether a given truss forms a suitable configuration?	Understanding	11
12	Why is it necessary to design truss members for both compression and tesion forces?	Understanding	11
13	Distinguish between determinate and indeterminate trusses	Understanding	11
14	Distinguish between fan and fink truss	Understanding	11
15	Why are Pratt truss more advantageous than Howe truss?	Understanding	11
16	State the different truss configurations that are often used in practice	Understanding	11
17	What is the economical depth of a simply supported and continuous truss?	Understanding	11
18	What is the economic range of spacing of a truss?	Understanding	11
19	What is an open web joist?	Understanding	11

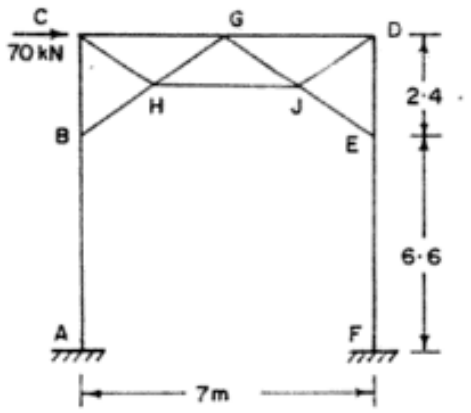
20	Why is it necessary to provide connections that will allow movements in the supports of trusses?	Understanding	11
Part - B (Long Answer Questions)			
1	Symmetric trusses of span 20m and height 5m are spaced 45m c/c Design the channel section purlins to be placed at suitable distances to resist the following loads Weight of sheeting including bolts = 171 kN/m2 Live load = 04 kN/m2 Wind load = 12 kN/m2 (Suction) Spacing of purlins = 14 m Design the purlin as per IS 800-2007	Applying	12
2	Mention the design steps for channel or I section purlins	Understanding	11
3	Enlist the loads acting on the structure and write'on live load calculation for roof truss	Understanding	12
4	Calculate dead load and live load per panel point of a Howe roof truss using following data: 1) Span of truss = 10 m 2) Spacing of truss = 3 m 3) Rise of truss= 25 m 4) No of panels = 8 5) Roof covering : AC sheets	Applying	12
5	Calculate wind load per panel point for the Howe truss of Q3(a) using following additional data: 1 Location - Surat 2 Permeability – Medium 3 Height of shed – 10 m 4 Terrain category 2 and class B structure 5 Probable life – 25 years 6 Take value of k3 = 10	Applying	12
6	Distinguish between angle purlin and tubular purlin	Understanding	11
7	Design a roof truss, rafter bracing, purlin, tie runner, side runner and eave girder for an industrial building located at Guwahati with a span of 20m and a length of 50m The roofing is galvanized iron sheeting Basic wind speed is 50m/s and the terrain in an open industrial area Building is class B with a clear height of 8m at the eaves	Applying	12
8	Explain in detail the steel or aluminium decking/ cladding	Understanding	12
9	An industrial building is made of 10 portal frames spaced 6m apart The frame has a span of 20m and 4m rise with a column height of 6m above ground d level Assuming the column bases are hinged , design the frame for dead, live and wind loads as per IS 875	Applying	12
10	Describe the components of a roof truss with neat diagrams	Understanding	12
11	Write on the dead loads, snow loads, wind loads and imposed loads considerations for design of roof trusses	Understanding	12
12	Discuss the steps involved in the analysis of roof trusses	Understanding	12
13	Explain unbraced frames in trusses with descriptive figures	Understanding	12

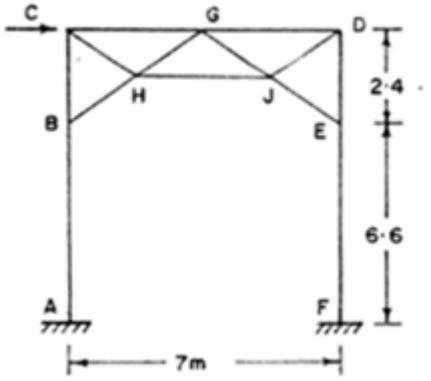
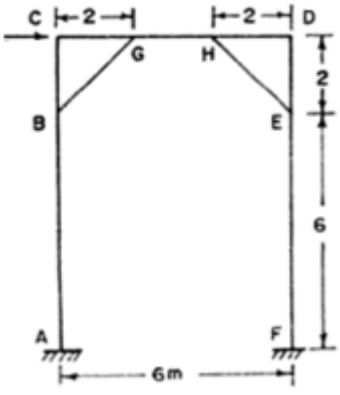
14	An industrial roof shed of size 20 mx30 m is proposed to be constructed at Mangalore near a hillock of 160 m and slope is 1 in 28 The roof shed is to be built at a height of 120 m from the base of the hill Determine the design wind pressure on the slope The height of roof shed shall be 12m	Applying	13
15	Explain the elements of an industrial building	Understanding	11
16	a) State advantages & disadvantages of tubular sections in steel structure b) Write note on design considerations as per IS code for tubular structure used as scafoulding c) Compare the hollow circular & hollow square section as thin' thin tubularsections, for its strength with respect to use as compression member	Understanding	13
Part - C (Problem Solving and Critical Thinking Questions)			
1	Symmetric trusses of span 20m and height 5m are spaced 45m c/c Design the channel section purlins to be placed at suitable distances to resist the following loads Weight of sheeting including bolts = 171 kN/m2 Live load = 04 kN/m2 Wind load = 12 kN/m2 (Suction) Spacing of purlins = 14 m Design the purlin as per IS 800-2007	Analyze & evaluate	15
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 mx 30 m	Analyze & evaluate	15
3	Design a purlin for a roof truss having the following data: Span of the truss = 60m ,Spacing of truss = 3m c/c, Inclination of roof = 30^o Spacing of Purlin = 2m c/c Wind pressure = 15 kN/m_2,Roof coverage= AC Sheeting weighing 200 N/m_2 , Provide a channel section Purlin	Analyze & evaluate	15
4	In an industrial building, the trusses of 16m span and 4m rise are spaced at 8m apart The building is in medium wind zone in an industrial area of plain land Design the purlin	Analyze & evaluate	15
5	Design a channel section purlin for the following data: Spacing of trusses =42m Spacing of purlin= 2m Live load on galvanized iron roofing sheets = 06 kN/m2 Wind load = 14 kN/m2 Slope of main rafter = 310	Analyze & evaluate	15

6	A shed is proposed to be constructed at Chennai The slope of the roof truss is corresponding to a pitch of 1/4 The average height of the roof above the ground is 12m the life of the structure is expected to be about 50 years The terrain has less obstruction The cladding length is in between 30m to 40 m the permeability of the truss is assumed to be medium Calculate the various load on the truss The roof covering is GI sheeting 	Analyze & evaluate	15
7	A purlin is to be designed to support elastic cladding such as GI sheets as roof material for trusses spaced at 35m c/c purlins, along principal rafter, are arranged at a distance of 135m c/c The pitch of the truss is 02m Design a section for the purlins and assume wind pressure as 44m/s	Analyze & evaluate	15
8	A tension member of a truss, carrying a tensile force of 25kN , meets the principal rafter carrying a compressive force of 100kN at right angles The panel length along the principal rafter is 24m design both members	Analyze & evaluate	15
9	An industrial roof shed of size 30 mx10 m is proposed to be constructed at Mangalore near a hillock of 170 m and slope is 1 in 28 The roof shed is to be built at a height of 110 m from the base of the hill Determine the design wind pressure on the slope The height of roof shed shall be 15m	Analyze & evaluate	15
10	A purlin is to be designed to support elastic cladding such as GI sheets as roof material for trusses spaced at 55m c/c purlins, along principal rafter, are arranged at a distance of 35m c/c The pitch of the truss is 04m Design a section for the purlins and assume wind pressure as 42m/s	Analyze & evaluate	15
11	Design a purlin for a roof truss having the following data: Span of the truss = 50m ,Spacing of truss = 3m c/c, Inclination of roof = 20o Spacing of Purlin = 28m c/c Wind pressure = 15 kN/m2,Roof coverage= AC Sheeting weighing 210 N/m2 , Provide a channel section Purlin	Analyze & evaluate	15
12	Symmetric trusses of span 30m and height 5m are spaced 45m c/c Design the channel section purlins to be placed at suitable distances to resist the following loads Weight of sheeting including bolts = 167 kN/m2 Live load = 065 kN/m2 Wind load = 12 kN/m2 (Suction) Spacing of purlins = 18 m Design the purlin as per IS 800-2007	Analyze & evaluate	15

13	Design a roof truss, rafter bracing, purlin, tie runner, side runner and eave girder for an industrial building located at Guwahati with a span of 30m and a length of 40m The roofing is galvanized iron sheeting Basic wind speed is 44m/s and the terrain in an open industrial area Building is class B with a clear height of 8m at the eaves	Analyze & evaluate	15
UNIT-IV DESIGN OF STEEL TRUSS GIRDER BRIDGES			
Part - A (Short Answer Questions)			
1	Draw neat sketch showing different types of bridge bearings	Understanding	16
2	What are lateral bracing?	Understanding	16
3	State the types of truss girder bridges	Remembering	16
4	What are stringers?	Understanding	16
5	Give the Fuller's Formula for self-weight of truss girders	Understanding	16
6	How is the inclination of the diagonals determined?	Understanding	16
7	List the types of truss girders	Understanding	16
8	State the Hudson's formula	Understanding	16
9	State the design considerations for the depth of truss girder bridges	Understanding	16
10	What are the parameters considered for an economic proportion of truss bridge?	Understanding	17
11	State the design criteria for determining the number of panels for a given span of truss girder bridge	Remembering	17
12	How is the general configuration decided for design of truss girder bridges?	Remembering	17
13	Distinguish between through type and deck type bridges	Remembering	17
14	Show the general arrangement of the components of truss girder bridges	Remembering	17
15	Explain sway bracings	Remembering	17
16	Sketch the common types of sections for webs in compression members	Remembering	17
Part - B (Long Answer Questions)			
1	A deck type 'N' truss bridge has 10 equal panels of 4m each with depth of truss 4m The dead load & live load intensities are 24 KN/m & 40 KN/m respectively Draw influence line diagram for members at top panel point from left end of truss Using impact factor 040 design top chord section	Applying	17
2	Write notes on the bottom lateral bracings with vivid diagrams	Understanding	17

3	Analyze the portal bracing of a truss girder bridge when it is subjected to a lateral force of 50kN  (a)	Applying	18
4	Discuss wind loads and wind effects on truss girder bridges	Understanding	18
5	A Pratt truss girder through bridge for single broad gauge track has an effective span of 40m The truss girder has 8 panels of 5m each The cross girders are spaced 5m apart while the stringers are spaced 2m between centre lines The sleepers are spaced 45cm from centre to centre and has a size of 28mx250mmx200mm, made of timber weighing 75kN/mm2 The weight of stock rails and check rails may be taken as 06 and 04 kN per metre The c/c/ spacing of main girders is 7m Design for the central panel, the top chord member, bottom chord member and verticals and diagonals Also design the joint Take height of the girder between CG of chord as 65m Design stringers and girders	Applying	18
6	How are the tension members designed for a truss girder bridge?	Understanding	18
7	Analyze and design the portal bracing of through type truss girder bridge subjected to a load of 70kN  	Understanding	19
8	Describe the joints in compression members of railway bridges	Understanding	19
9	Explain analysis of portal bracings with deep horizontal beams	Understanding	19

10	A Pratt truss girder through bridge for single broad gauge track has an effective span of 40m The truss girder has 8 panels of 5m each The cross girders are spaced 5m apart while the stringers are spaced 2m between centre lines The sleepers are spaced 45cm from centre to centre and has a size of 28mx250mmx200mm, made of timber weighing 75kN/mm2 The weight of stock rails and check rails may be taken as 06 and 04 kN per metre The c/c/ spacing of main girders is 7m Design for the central panel, the top chord member, bottom chord member and verticals and diagonals Also design the joint Take height of the girder between CG of chord as 65m	Applying	19
11	Determine the decrease or increase of forces in central chord members of the leeward truss-girder in the following case: a) Overturning effect due to wind, when the bridge is loaded b) Lateral effects of top and bottom chord bracings when the bridge is loaded	Understanding	19
12	Discuss the analysis of portal bracing with horizontal beams and knee braces	Understanding	18
13	Analyze the portal bracing 	Applying	19
Part - C (Problem Solving and Critical Thinking Questions)			
1	Design completely a through type truss girder bridge to carry a single track BG loading for the following data: 1) Effective span= 45m 2) c/c spacing of stringer = 22m 3) sleepers and their spacing = 250x130x25mm @ 05m c/c 4) density of timber = 74kN/mm3 5) weight of stock rails = 044kN/m 6) weight of guard rail = 026kN/m 7) weight of fastenings etc = 028kN/m of track	Analyze & evaluate	19
2	A Pratt truss girder through bridge for single broad gauge track has an effective span of 40m The truss girder has 8 panels of 5m each The cross girders are spaced 5m apart while the stringers are spaced 2m between centre lines The sleepers are spaced 45cm from centre to centre and has a size of 28mx250mmx200mm, made of timber weighing 75kN/mm2 The weight of stock rails and check rails may be taken as 06 and 04 kN per metre The c/c/ spacing of main girders is 7m Design for the central panel, the top chord member, bottom chord member and verticals and diagonals Also design the joint Take height of the girder between CG of chord as 65m design the top and bottom lateral bracings for through type truss girder bridge	Analyze & evaluate	19

3	A Pratt truss girder through bridge for single broad gauge track has an effective span of 30m The truss girder has 6 panels of 4m each The cross girders are spaced 5m apart while the stringers are spaced 2m between centre lines The sleepers are spaced 45cm from centre to centre and has a size of 28mx250mmx200mm, made of timber weighing 75kN/mm2 The weight of stock rails and check rails may be taken as 06 and 04 kN per metre The c/c/ spacing of main girders is 7m Design for the central panel, the top chord member, bottom chord member and verticals and diagonals Also design the joint Take height of the girder between CG of chord as 45m Design stringers and girders	Analyze & evaluate	20
4	Design completely a through type truss girder bridge to carry a single track BG loading for the following data: 1) Effective span= 39m 2) c/c spacing of stringer = 19m 3) sleepers and their spacing = 250x150x28mm @ 04m c/c 4) density of timber = 74kN/mm3 5) weight of stock rails = 044kN/m 6) weight of guard rail = 026kN/m 7) weight of fastenings etc = 028kN/m of track	Analyze & evaluate	20
5	Analyze the portal bracing 85kN  	Apply & evaluate	20
6	Analyze and design the portal bracing of through type truss girder bridge subjected to a load of 110Kn 110kN  	Analyze & evaluate	20
7	A deck type ‘N’ truss bridge has 8 equal panels of 5m each with depth of truss 3m The dead load & live load intensities are 32KN/m & 40 kN/m respectively Draw influence line diagram for members at top panel point from left end of truss Using impact factor 040 design top chord section	Analyze & evaluate	20

8	A deck type 'N' truss bridge has 10 equal panels of 4m each with depth of truss 4m The dead load & live load intensities are 24 KN/m & 40 KN/m respectively Draw influence line diagram for members at top panel point from left end of truss Using impact factor 040 design top chord section	Analyze & evaluate	20
UNIT-V DESIGN OF STEEL BUNKERS AND SILOS			
Part - A (Short Answer Questions)			
1	For flow of solids out of a bin which opening is preferable, slide opening or bottom opening? Why?	Remembering	21
2	What are the factors on which the rate of flow of granular solids by gravity, through a circular opening in the bottom of a bin, depends on?	Remembering	21
3	Explain hoe freely falling solids flow out of bins?	Remembering	21
4	Explain bin storage and bulk storage	Understanding	21
5	For the design of bins what is the important characteristic property of solids being stored in the bin?	Remembering	21
6	What are the material properties required for design oh storage hoppers?	Understanding	21
7	Briefly explain the design procedures of storage bins	Remembering	21
8	Classify the types of bins	Remembering	21
9	What is angle wall friction?	Remembering	21
10	Sketch the typical cross section of a silo	Understanding	21
11	Distinguish between deep and shallow bins	Understanding	21
12	Illustrate sliding wedge method of designing bins	Understanding	21
13	Explain initial pressure and flow pressure	Understanding	21
14	What are forces acting on the walls of bins?	Understanding	21
Part - B (Long Answer Questions)			
1	Explain the types of flow through hopper with descriptive figures	Understanding	22
2	State the typical bin geometries with descriptive sketches	Understanding	22
3	Explain about design of Silos by using AIRY's method	Understanding	22
4	Give a detailed description of the different designs of hoppers	Understanding	22
5	Discuss jannsen's theory for design of bins	Understanding	22
6	What are the design parameters stated in IS 9178-1(1979)	Understanding	22
7	Write the step wise procedure followed in the design of Bins	Understanding	22
8	What are the problems concerned with the design of storage hoppers?	Understanding	22
9	a)) Distinguish between bunker and silo with the help of diagram b) Explain factors affecting design of bins	Understanding	22
10	Vividly explain the different failure modes of silos	Understanding	22

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