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ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, NOV / DEC 2024

B.E. CIVIL ENGINEERING
VI Semester
CE5601 Design of Steel Structures
(Regulation2019)
Note: Indian Standard codes IS800 and SP 6(1) are permitted

Time:3hrs Max.Marks: 100

CO1	Recognize the design philosophy of steel structures and identify the different failure modes of bolted and welded connections, and determine their design strengths
CO2	Select the most suitable section shape and size for tension and compression members and beams according to specific design criteria
CO3	Apply the principles, procedures and current code requirements to the analysis and design of steel tension members, columns, column bases and beams
CO4	Identify and compute the design loads on Industrial structures, and gantry girder
CO5	Find out ultimate load of steel beams and portal frames using plastic analysis

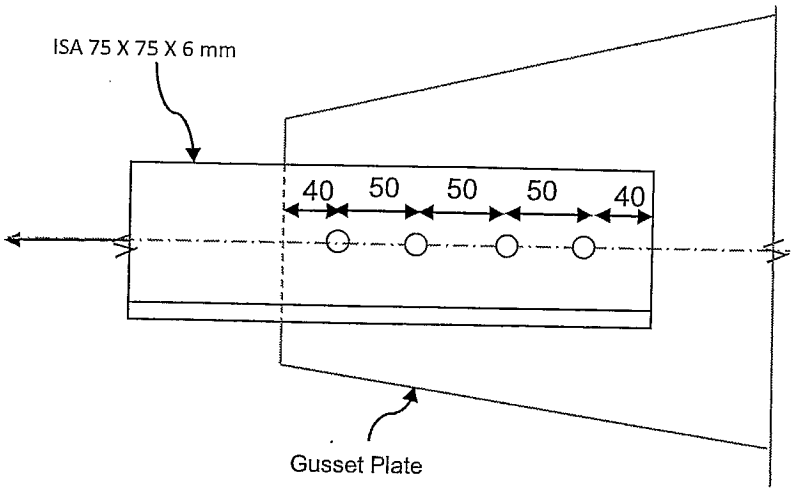
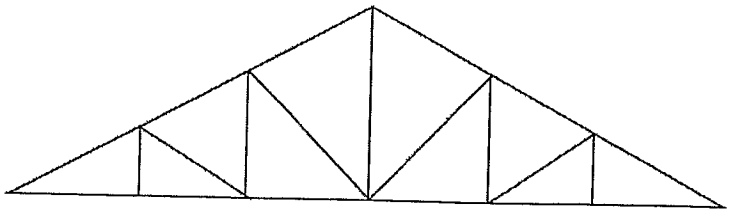
BL – Bloom's Taxonomy Levels
(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

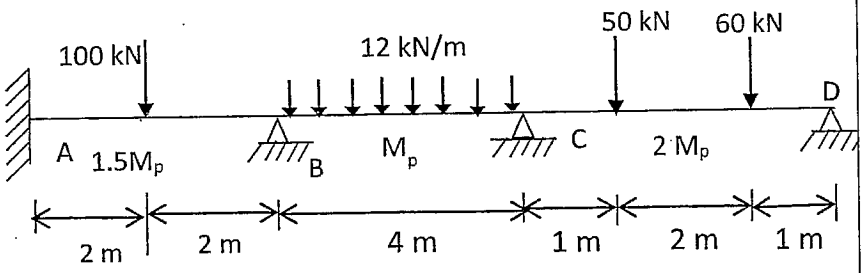
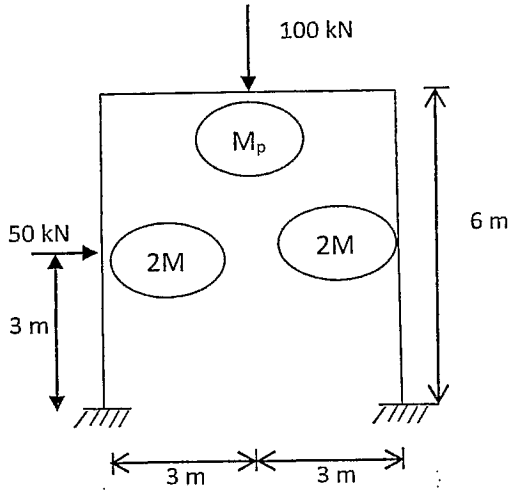
PART- A(10x2=20Marks)
(Answer all Questions)

Q.No.	Questions	Marks	CO	BL
1	List any four advantages of welded joint	2	1	L1
2	Write the principle of load transfer in high-strength friction grip bolts	2	1	L1
3	Enumerate the Indian standard codal provisions for design of lacings in a built-up column	2	2	L1
4	Bring out the importance of column buckling curves	2	2	L2
5	Compare compact and semi-compact section.	2	3	L2
6	Write a note on web crippling mode of failure	2	3	L1
7	Write a note on purlin design.	2	4	L1
8	Compare drag force and braking force in gantry girder design.	2	4	L2
9	List the independent sway mechanisms of a frame	2	5	L1
10	Define collapse load.	2	5	L1

PART- B(5x 13=65Marks)
(Restrict to a maximum of 2 subdivisions)

Q.No.	Questions	Marks	CO	BL
11 (a)	Design a lap joint between two plates of size 100 mm x 16 mm thick and 100 mm x 10 m thick so as to transmit a factored load of 100 kN using M16 bolts of grade 4.6 and grade 410 plate.	13	1	L4
	OR			
11 (b)	A tie member of a truss consisting of an angle section ISA 75 x 75 x 8 of Fe410 grade, is welded to a 10 mm gusset plate. Design a weld to transmit a load of 400 kN. Assume shop weld.	13	1	L4

12 (a)	A single angle 75 x 75 x 6 is connected to an 8 mm thick gusset plate at the ends with four 20 mm diameter bolts to transfer tension as shown in Fig Q12(a) Determine the tensile strength of tie member ISA 100 x 100 x 8 when it is connected to a gusset plate of thickness 12 mm through one leg as shown in Fig Q12b by single row of 16 mm bolts.  ALL DIMENSIONS IN mm Fig. Q12a	**13**	2	L
	OR			
12 (b)	Determine the design axial load on the column section ISMB400. The effective height of the column is 6 m in y-y direction and 3 m in z-z direction.	**13**	2	L4
13 (a)	Determine the moment carrying capacity of a laterally unrestrained ISMB 350 member of length 3m.	**13**	3	L4
	OR			
13 (b)	Design a simply supported beam of 6 m span to carry a factored maximum bending moment of 550 kNm and factored maximum shear force of 250kN. The beam is provided with adequate lateral restrain by reinforced concrete floor slab.	**13**	3	L4
14 (a)	A roof truss shown in Fig. Q14a is of span 12 m is located at Chennai, Tamilnadu. The central rise of the truss is 3 m, the weight of the AC sheeting is 175 N/m^2. The height upto the eaves level is 8 m and the spacing of the truss is 4 m c/c. Corrugated GI Sheets (Self-wt 131 N/m^2) are used for covering and spacing of purlin limited to 1.2 m. Determine the dead load, live load and wind load at the panel points.  Fig. Q 14(a)	**13**	4	L4

	OR			
14 (b)	Determine the critical loads on the gantry girder for the following data Crane type: EOT Crane capacity : 300 kN Weight of crane and crab : 300 kN Weight of crane : 200 kN Minimum hook approach : 1.2 m Centre-to-centre distance between wheels : 3.2 m Span of the gantry girder : 5m Centre-to-centre distance between gantries : 15 m Weight of rail : 300 N/m Height of rails : 75 mm Yield stress of steel : 250 MPa	**13**	4	L4
15 (a)	Determine the plastic moment capacity of the continuous beam shown in Fig. Q15a. Take a load factor of 1.5.  Fig.Q15a	**13**	5	L4
	OR			
15 (b)	For the frame shown in Fig. Q15b, find the plastic moment capacity  Fig. Q15b	**13**	5	L4

PART- C(1x 15=15Marks)

(Q.No.16 is compulsory)

Q.No.	Questions	Marks	CO	BL
16.	Design a column to support an axial load of 2500 kN, assuming that the column has an effective length of 8m with respect to the z-axia and 4 m with respect to the y-axis.	15	3	L5