B.M.S College of Engineering, Bengaluru-560019

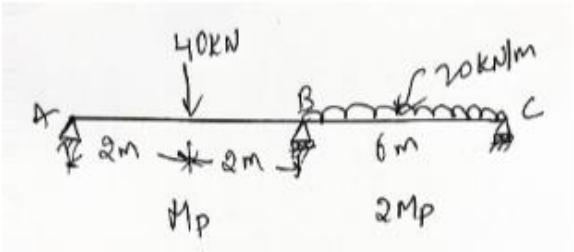
Autonomous Institute Affiliated to VTU

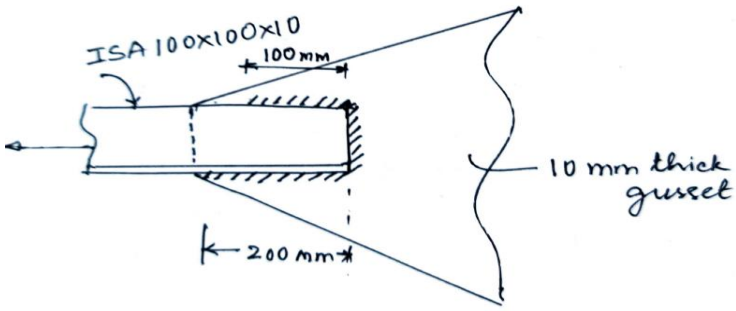
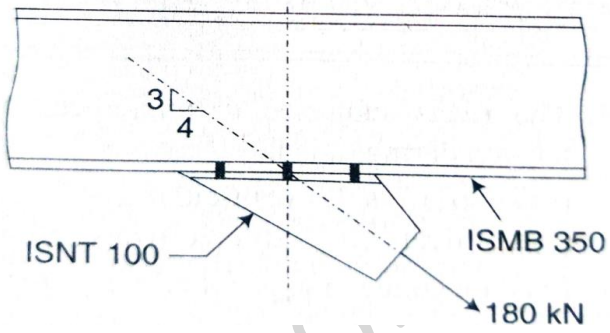
January / February 2025 Semester End Main Examinations

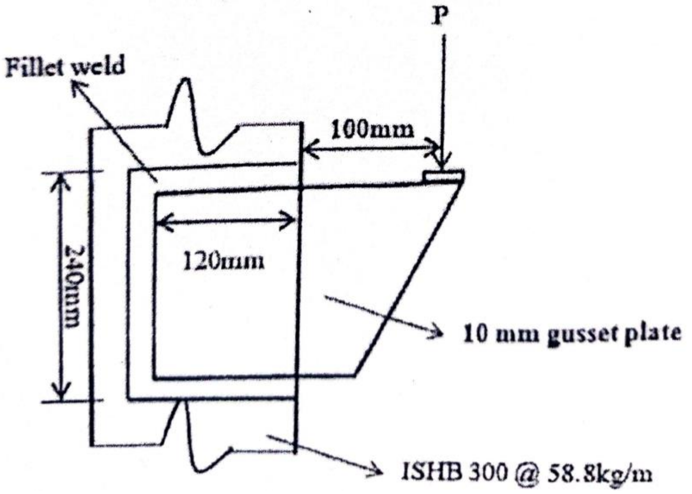
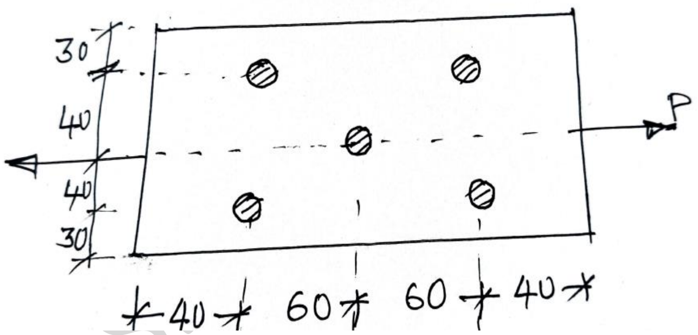
Programme: B.E. **Semester: VI**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 22CV6PCDSS **Max Marks: 100**
Course: Design of Steel Structural Elements

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.
3. Use of IS 800-2007 & Steel Hand book permitted
4. Draw neat sketches wherever necessary.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT – I	*CO*	*PO*	Marks
1	a)		Explain the advantages of steel structures with specific reference to its Ductility and Economy	*CO* 1	*PO1*	**5**
	b)		Explain with neat sketches Plastic hinge and mechanism as applied to steel structures	*CO* 1	*PO1*	**6**
	c)		A two span continuous beam ABC with span AB=6m and BC=8 m is loaded with concentrated loads of 120 KN at 2 m from A and an udl of 30KN/m over the complete span BC. The end A is fixed and the right end of 8m span is simply supported. The load factor is 2 and the shape factor is 1.12. Design a suitable section for both the spans.	*CO* 2	*PO2*	**9**
			OR			
2	a)		Calculate the shape factor of triangular section and rectangular section.	*CO1*	*PO1*	**10**
	b)		Calculate Mp for the continuous beam shown in fig Q2b. Take load factor 1.5.  fig Q2b			**10**
			UNIT – II			
3	a)		Discuss with neat sketches various modes of failure of bolted connections.	*CO* 1	*PO1*	**5**

		b)	Determine the service load which can be applied to the fillet weld for the case shown in Fig Q3(b). Assume weld size as 3 mm. Grade of material of the member is Fe410  Fig Q3(b).	*CO* 1	*PO1*	**6**
		c)	Check the safety of the bolted connection shown in FigQ2(c). Bolts used are bearing bolts of grade 4.6 and 20 mm diameter with threads not in shear plane. Material used for rolled section is Fe410 grade.  FigQ2(c).	*CO* 1	*PO1*	**9**
			OR			
	4	a)	Design a double cover slip critical bolted butt joint to connect two plates of thicknesses 20 mm and 8 mm, each 200 mm wide. The cover plate thickness is 6mm. The joint is to support a working load of 350 KN. Assume 20 mm diameter HSFG bolts of grade 8.8 Show the neat sketch of the design. Also find the efficiency of the joint	*CO* 1	*PO1*	**8**
		b)	An end reaction 'P'= 250 KN (factored) from a beam is to be transferred to a column of ISHB 350 @ 58.8 kg/m through a bracket as shown in FigQ4(b). The grade of steel is Fe 410. Design a suitable size of fillet weld for the connection of the bracket plate with column flange.	*CO* 1	*PO1*	**12**

			 FigQ4(b).			
			UNIT – III			
	5	a)	Explain with a sketch the significance of shear lag in tension member.	***CO*** 1	***PO1***	**5**
		b)	Considering only the net section rupture, evaluate the maximum factored load resisted by a flat section 140 ISF10 with a bolting pattern as shown in FigQ5(b). Assume 20 mm diameter black bolts of grade 4.6. All dimensions shown are in mm.  FigQ5(b)	***CO*** 2	***PO1***	**5**
		c)	Design a tension member to carry a factored load of 400 KN. Two unequal angles connected back to back on one side of gusset 10mm thick, with shorter legs outstanding are desirable. The member is 3.4 m between c/c of connections. Design the member assuming stress eversal for the member.	***CO*** 2	***PO2***	**10**
			OR			
	6	a)	Explain the factors affecting strength of tension members.	***CO2***	***PO1***	**06**
		b)	A column 5m long is to support a factored load of 5500kN.If the ends at the column are effectively held in position and direction at both ends. Design the column. Use additional plates if required.	***CO2***	***PO2***	**14**

			UNIT – IV			
	7	a)	Design a single angle discontinuous strut of a roof truss to carry a load of 125 KN. Assume two bolts are used for connection at each end and the length of the strut between centre to centre of connections is 3 m.	***CO*** 2	***PO2***	**10**
		b)	A discontinuous strut of 3 m length between connections consists of two angles 100mmx 75 mm x8 mm. The angles are placed back to back on the opposite sides of a gusset plate 10 mm thick. With long legs connected. Calculate the design compressive strength under working conditions.	***CO*** 1	***PO1***	**10**
			OR			
	8		A column in a multistoried building is 4m high and is held in position and direction at the base but restrained only in direction at the top and carries an axial load of 1250 KN. Design a built up column with two channels face to face. Also design the lacing system and draw a neat sketch of the column designed.	***CO*** 2	***PO2***	**20**
			UNIT – V			
	9	a)	Explain laterally restrained and laterally unrestrained beams.	***CO*** 1	***PO1***	**5**
		b)	A conference hall 8m x 18 m is provided with a 125 mm thick RCC roof slab over rolled steel beams spaced at 3m c/c. A wearing coat of 100 mm average thickness is provided over the roof. The live load on the slab is 4 KN/m^2. Design one of the intermediate beam section if the compression flange is laterally restrained throughout. Check for all other criteria of failure.	CO2	***PO2***	**15**
			OR			
	10		Calculate the load carrying capacity of simply supported beam with ISMB500@86.9 kg/m section for an effective span of 5 m for the following cases. i) laterally restrained ii) laterally unrestrained	***CO2***	***PO2***	**20**

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