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

Autonomous Institute Affiliated to VTU

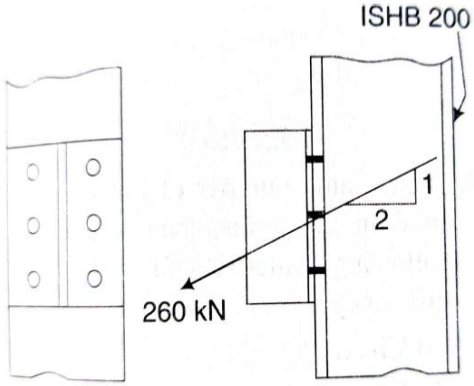
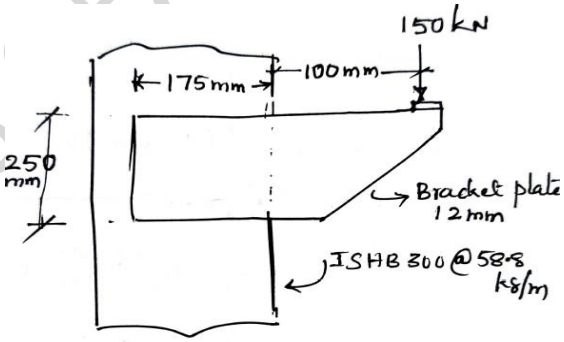
June 2025 Semester End Main Examinations

Programme: B.E. **Semester: VI**
Branch: Civil Engineering. **Duration: 3 hrs.**
Course Code: 20CV6PCDSS **Max Marks: 100**
Course: Design of Steel Structural Elements & Software Applications Lab

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 and steel tables permitted.

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.

				CO	*PO*	Marks
			UNIT – I			
1	a)		With a neat sketch explain in detail the stress v/s strain behavior of mild steel.	CO1	PO1	**6**
	b)		Explain Rolled structural steel. With neat sketches explain some of the commonly used rolled steel sections in structural steel construction.	CO1	PO1	**7**
	c)		Explain the advantages of steel structures with specific reference to ductility, toughness and economy	CO1	PO1	**7**
			OR			
2	a)		Compare between working stress method and limit state method of design of structural steel	CO1	PO1	**7**
	b)		Explain briefly the design considerations adopted in structural steel design.	CO1	PO1	**6**
	c)		Explain the various loads and its combinations specified in IS-800-2007 for design of structural steel elements.	CO1	PO1	**7**
			UNIT – II			
3	a)		A member made from channel section ISMC 300 @ 35.8 kg/m is to be connected to a gusset plate 12 mm thick. Design a slip critical connection for the member to support a factored load of 600 KN, using 24 mm diameter high strength bolts of grade 8.8. Grade of steel of the member is Fe410	CO1	PO3	**10**

		b)	Investigate the safety of the connection shown in Fig1. The bolts used are 20 mm diameter bearing bolts of a 4.6 grade with threads in shear plane. The column section is ISHB 200 @ 37.3 kg/m. and connecting angle is ISA 100x100x10 mm. Neglect prying action. Steel grade is Fe410. Necessary pitch and edge distance for bolts may be assumed if required..  Fig1	CO1	PO2	**10**
			OR			
	4	a)	Explain the relative advantages of welded connection over bolted connection. List the draw backs of welded connection	CO1	PO1	**6**
		b)	A bracket plate is welded to the flange of a column section ISHB 300 @ 58.8kg /m as shown in Fig2. Design the size of weld required to support a service load of 150 KN. Assume field welding. Grade of steel is Fe410  Fig2	CO1	*PO3*	**14**
			UNIT – III			
	5	a)	Explain the significance of shear lag in the design of tension members	CO3	*PO1*	**6**

		b)	Design a tension member comprising of double angles placed back to back on opposite sides of a gusset plate 12 mm thick. Assume the connection is through the longer leg of the angle. The member is to carry a factor load of 400 KN. Use 20 mm diameter bolts of grade 4.6. The grade of steel of member is Fe410.	CO3	*PO3*	**14**
			OR			
	6	a)	Briefly explain the failure criteria for design of tension members as per IS 800-2007 code	CO3	*PO1*	**05**
		b)	A tie member in bracing system consists of two angles 125x125x8mm bolted to a 12mm thick gusset plate one on each side using a single row of bolts. Determine the tensile capacity of the tie member and the number of bolts required to develop full capacity of the member. The yield strength and ultimate strength of the material is 250MPa and 410MPa, respectively. Assume HSFG bolts of grade 8.8	CO3	*PO3*	**15**
			UNIT – IV			
	7	a)	Design a column to support a factored load of 5000 KN using ISHB 350 @ 710 N/m and cover plates 20 mm thick. The length of column is 5 m with one end fixed ant the other hinged.	CO3	*PO3*	**8**
		b)	Design a single angle discontinuous strut to carry a factored load of 100 KN. The length of the strut is 3 m, between intersections. It is connected to a 12 mm thick gusset plate by two number of 20 mm diameter 4.6 grade bolts.	CO3	*PO3*	**12**
			OR			
	8		Design a built up column with four angles, The column is 12 m long and supports a factored axial compressive load of 800 KN. The column is held in position and restrained against rotation at each end. Design a suitable lacing system also .Use steel of grade Fe410.Assume suitable diameter and grade for the bolts.	CO3	*PO3*	**20**
			UNIT – V			
	9	a)	Explain the significance of web buckling and web crippling in the design of beams	CO3	*PO1*	**6**
		b)	Calculate the load carrying capacity of simply supported beam with ISMB 500 @86.9 kg/m section for an effective span of 8 m. Assume the beam to be laterally un restrained.	CO3	*PO2*	**14**
			OR			
	10	a)	Design a simply supported beam of 11m effective span carrying a total factored load of 52kN/m. The compression flange of beam is laterally supported by floor construction. Check for deflection, web crippling and web buckling also	CO3	*PO3*	**16**
		b)	Explain laterally supported and unsupported beams with sketch	CO3	*PO1*	**04**

****