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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester, M. Tech - Civil Engineering (MCAD)

Semester End Examination; October -2022

Advanced Design of Steel Structures

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Apply the design concepts involved with laterally unrestrained beams and structural members subjected to combined forces in analyzing and designing such members.

CO2: understand the influence of web openings on the structural behaviour of beams and to extend this concept for the design of castellated beams and Vierendeel girders.

CO3: Apply the design concepts involved with light gauge steel structures and tubular structures.

CO4: Apply the knowledge of structural members subjected to fire and able to know the methods of fire protection.

Note: ***I)*** *Answer any* ***FIVE*** *full questions, selecting* ***ONE*** *full question from each unit.*

II) *Any* ***THREE*** *units will have internal choice and remaining* ***TWO*** *unit questions are compulsory.*

III) *Each unit carries 20 marks.*

Q. No.	Questions	Marks	BLs	COs	POs
	UNIT - I	**20**			
1 a.	With the help of neat sketches, explain how moment of inertia and shear center parameter affect the behavior of laterally unsupported beams. Hence with relevant expression define elastic critical moment.	10	L2	CO1	PO1,3,4
b.	A simply supported beam IS MB 400 @ 61.6 kg/m has as effective span of 5 m. Find the design strength of the beam in bending if the beam is laterally unsupported. Also find the intensity of Udl that the beam can carry under service condition. The grade of steel is E250.	10	L6	CO1	PO1,3,4
	OR				
1 d.	Two identical beams of 5 m simply supported span spaced at 2 m c/c jointly support machinery and floor load in such a way that each beam carries dead load 20 kN/m and live load of 40 kN/m. The beams are laterally unsupported. Take f_y = 250 Mpa. Design the beam, apply the necessary checks.	20	L6	CO1	PO1,3,4
	UNIT - II	**20**			
2 a.	Design a beam column carrying compression load of 400 kN at an eccentricity of 125 mm along the minor axis. Assume that the ends of the column are hinged with an unsupported length of 5 m. The grade of steel is E250.	20	L6	CO2	PO1,3,4

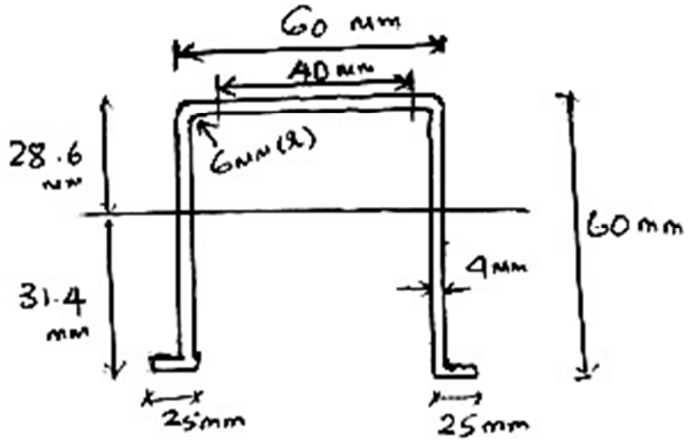
UNIT - III **20**

3 a.	Design castellated beam to carry an imposed load of 5 kN/m and dead load of 4 kN/m over simply supported span of 16 m. Assume that the compression flange is fully restrained.	20	L6	CO2	PO1,3,4

UNIT - IV **20**

4 a.	Explain briefly with relevant sketches the following with respect to cold formed steel sections: i) Method of manufacturing process ii) IS code standards and specifications (Sketch) iii) Advantages over hot rolled sections with respect to efficiency iv) Connections v) Structural considerations and corrosion protection needs	20	L2	CO3	PO1,3,4

OR

4 d.	Design a hat section Fig. Q4(d) for a simply supported beam of span 2.5 m. The super imposed load is 2 kN/m. The yield strength of steel is f_y = 300 MPa. Check for adequacy of the given section with respect to deflection.  Fig.4(d)	20	L6	CO3	PO1,3,4

UNIT - V **20**

5 a.	Explain the various factors which affect the fire resistance of steel member.	10	L2	CO4	PO1,5
b.	Explain the various methods of fire protections with help of neat sketches.	10	L2	CO4	PO1,5

OR

5 d.	Explain the effect of elevated temperature on the strength of structural steel with suitable plots.	10	L2	CO4	PO1,5
e.	What is fire load? Explain fire rating as applied to structural steel.	10	L1	CO4	PO1,5