U.S.N.										

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

Autonomous Institute Affiliated to VTU

January 2024 Semester End Main Examinations

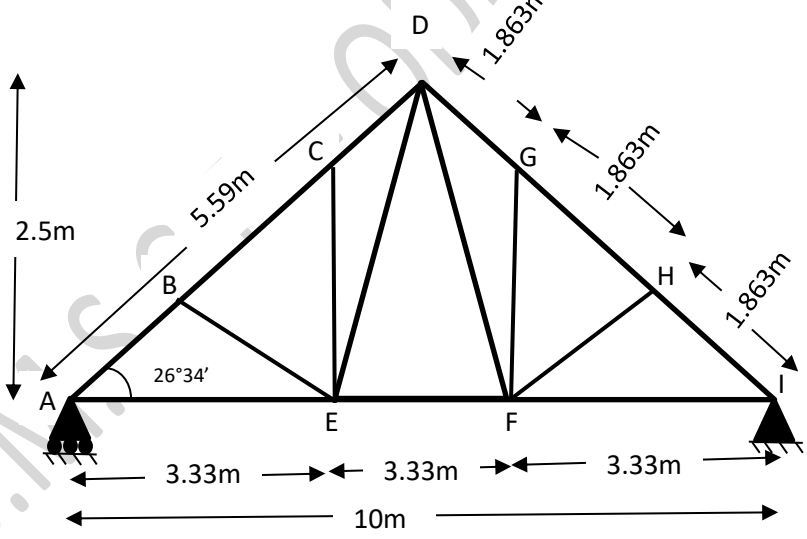
Programme: B.E. **Semester: VII**
Branch: Civil Engineering **Duration: 4 hrs.**
Course Code: 21CV7PCDDG **Max Marks: 100**
Course: Design and Drawing of RCC and Steel Structures

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 456, IS 800, Steel Tables and SP-16 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.

		PART-A	CO	PO	Marks
1	a)	A Rectangular beam of size 230mm x 500mm is continuous over number of columns spaced @ 4.5 m c/c. The width of the support is 300mm. Main Reinforcement @ mid span or +ve steel are 4#-20mm dia. Support or –ve steel are 4# 20mm dia. Shear Reinforcement 2L -8# Vertical Stirrups @ 150mm c/c near column for a distance of 1m from support and 300mm c/c in the remaining portion. Draft the following views a. Longitudinal Section b. Cross Section at support section c. Cross Section at edge Section	*CO1*	*PO1*	**10**
	b)	Design a slab type rectangular combined footing for two columns of size 300mm x 450mm and 300mm x 600mm, subjected to axial loads of 650kN and 900kN respectively. The columns are spaced at 3.6m c/c. The width of the footing is restricted to 1.8m. Use M20 grade concrete and Fe415 steel. Assume SBC of soil = 160kN/m^2 Draw to a suitable scale i)Longitudinal section of footing ii)Cross-section of footing at mid-span	*CO1*	*PO3*	**40**
		OR			
2	a)	A one-way slab system has been provided for a hall of internal dimensions 3 m x 7 m. Supported on 230 mm wall thickness. Slab thickness is 150mm. Main reinforcement consists of 10mm dia @ 150mm c/c. Distribution steel consists of 8mm dia @ 300mm c/c. Draft a. Plan showing reinforcements particulars b. Cross section along shorter span c. Cross section along longer span.	*CO1*	*PO1*	**10**

		b)	Design a cantilever retaining wall (only stem and heel slab) to retain an earth embankment with a horizontal top 3.5m above ground level. The unit weight of back fill is 18kN/m^3. Angle of internal friction ϕ = 30°. SBC of soil = 180kN/m^2. Take coefficient of friction between soil and concrete = 0.55. Assume the main steel 12#@150c/c and distribution steel 10#@250c/c for toe slab. Adopt M20 grade concrete and Fe415 grade steel. Depth of foundation = 1.0m. Draw to a suitable scale i)cross section of retaining wall with reinforcement details ii) elevation of stem with reinforcement details	***CO1***	***PO3***	**40**
			PART-B			
	3	a)	A beam ISMB 400 @ 61.6 Kg/m. Using framed bolted connection. Size of cleat angle is ISA 150 x 115 x 12 mm. # 6-20 mm bolts in 2 rows is used to connect angle and beam. #3- 20mm bolts for each angle to connect angle and column flange. Use pitch= 60 mm, Edge distance = 35 mm. Draw a) Front view b) Side view	***CO2***	***PO1***	**10**
		b)	Design a roof truss shown in figure below. With forces in each member of the truss are given in table 1. The size of RC column supporting the truss is 300mm x 300mm. Use M20 grade concrete for the column. Design the truss using bolt of M16, property class 4.6 for connections and also design anchor bolts.	***CO2***	***PO3***	**40**



Member	Design force in kN	
	Compression	Tension
Top Chord Member	54.25	-
Bottom Chord member	-	48.31
Diagonal Member (DF, DE)	14.35	-
Member BE, HF	-	24.50
Member CE, GF	12.40	-

			Draw to a suitable scale i)elevation of truss ii) enlarged view of joint D			
			OR			
	4	a)	The secondary beam ISMB 300 @ 461 N/m is to be joined to the main beam ISMB 400 @ 616 N/m. Two angles ISA 90 x 90 x 6 mm are used for connection. Three bolts of the diameter 20 mm are used to connect angles to the web of the ISMB 400.The flanges of the both beams are at the same level. Draft 1. Sectional elevation 2. Side view showing all details.	***CO2***	***PO1***	**10**
		b)	Design a welded plate girder of 20m span to support a uniformly distributed live load of 70KN/m over the span using the following data. Yield stress of steel is 250 N/mm^2, top flange restrained laterally. Design the cross-sectional details of the plate girder to confirm to the specifications of IS 800-2007 Take the size of the end bearing stiffeners as 100mm x 10mm. Design the central cross section and intermediate stiffeners. Assume the size of weld= 5mm for end bearing stiffeners and intermediate stiffeners. Draw to a suitable scale i. Half sectional elevation showing relevant details ii. Cross section at supports	***CO2***	***PO3***	**40**

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