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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, APRIL - 2025

DESIGN OF STEEL AND RCC STRUCTURES

[Maximum marks: 75]   [Time: 3 Hours]

[Note – Use of IS 456-2000, IS 800-2007, SP16 and Steel tables are permitted.
Any missing data may be suitably assumed.]

PART A

I. Answer all the following questions in one word or one sentence. Each question carries 1 mark.

(9 x 1 = 9 Marks)

		Module outcome	Cognitive level
1	Rupture of net section of a tension member is decided by its ……. strength.	M1.01	R
2	As per IS800-2007, the effective length of a compression member is ……. times its actual length, if one ends is restrained against translation or rotation, while the other end is free to translate/rotate.	M1.02	R
3	List any one example of a built-up column.	M1.03	R
4	The moment corresponding to which the extreme fibres just yield is called ……….	M2.01	R
5	………. section is otherwise known as Class 4 cross-section.	M2.02	R
6	Define Balanced section.	M3.02	R
7	Partial safety factor for steel is ………	M3.01	R
8	As per IS456-2000, columns should have a minimum longitudinal reinforcement of ………..%	M4.01	R
9	List the two types of shear which the design of an isolated footing shall necessarily satisfy.	M4.02	R

PART B

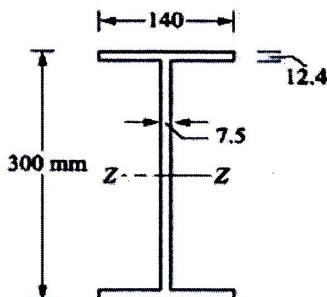II. Answer any eight questions from the following. Each question carries 3 marks.

(8 x 3 = 24 Marks)

		Module outcome	Cognitive level
1	Write down the equation for net section rupture of single angle Tension Members.	M1.01	R
2	Write three codal provisions to determine effective length of compression members, as per IS 800-2007.	M1.03	U

3	Draw a neat sketch of Laced column.	M1.04	U
4	Compare Plastic and Compact cross-sections, as per IS 800-2007.	M2.01	R
5	Write the codal provisions for deflection limits in the design of laterally supported beams, according to IS 800-2007.	M2.01	U
6	Explain the concept of Limit State of Collapse.	M3.01	R
7	Differentiate Under-reinforced and Over-reinforced beams.	M3.02	U
8	Compare short column and long column.	M4.01	U
9	List any three types of isolated footings.	M4.03	R
10	Sketch the critical sections about which the check for one-way shear and two-way shear are performed.	M4.04	U

PART C
Answer all questions. Each question carries seven marks.

(6 x 7 = 42 Marks)

		Module outcome	Cognitive level
III	Determine the tensile strength of a roof tie double-angle ISA 90x60x6 mm connected to a gusset plate by weld over 200mm length. Take $f_y = 250$ N/mm^2 and $f_u = 410$ N/mm^2.	M1.02	A
	OR		
IV	Write short notes on: (a) Gross section yielding (b) Net section Rupture	M1.01	U
V	Calculate design strength due to yielding of gross section for an angle ISA 150 x 115 x 8 mm. It is connected to gusset plate by weld over a length of 140mm. Take $f_y = 250$ N/mm^2 and $f_u = 410$ N/mm^2.	M1.01	A
	OR		
VI	Write the procedure for design of double – angle compression members.	M1.02	U
VII	Calculate the Plastic moment carrying capacity of a given I-section about z-z axis shown in figure. Take $f_y = 250$ N/mm^2. All dimensions in mm.	M2.01	U

	OR		
VIII	Write the procedure to determine Bending strength of laterally supported steel beams.	M2.03	U
IX	Calculate the Ultimate Moment of resistance of a beam section 200mm wide and 400 mm effective depth. It is reinforced with 4 bars of 16mm dia. Use Fe250 grade steel and M20 grade concrete.	M3.01	A
	OR		
X	Write the detailed procedure for the Design of a one-way simply supported slab.	M3.02	U
XI	An RCC beam 250 x 400mm effective depth having 4.33m effective span. It is subjected to Uniformly Distributed Load 40kN/m throughout the span. The beam is reinforced with 2 bars of 25mm dia on tension side. Check for shear and design shear reinforcements if necessary. Use M20 concrete and Fe415 steel.	M3.04	A
	OR		
XII	Write the detailed procedure for the Design of a two-way simply supported slab.	M3.04	U
XIII	Calculate the longitudinal reinforcement for a short circular column of diameter 500mm loaded axially by 2000 kN. Use M20 concrete and Fe415 steel.	M4.01	U
	OR		
XIV	Determine the depth of a square footing for a short axially loaded column 300mm x 300mm carrying 600kN ultimate load, based on one-way shear. Use M20 concrete and Fe415 steel. Safe Bearing Capacity of soil is 180kN/m^2.	M4.02	U

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