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(Revision-2021)

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, NOVEMBER - 2023

DESIGN OF STEEL AND RCC STRUCTURES

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

Instructions

- Use of IS-456:2000, IS-800:2007, SP16 and steel tables are permitted.
- Any suitable data for design questions can be assumed unless given.

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	The value of modulus of elasticity of steel is …………. MPa.	M1.01	R
2	The length of an equivalent column with hinged at both ends and having the same load carrying capacity as the member under consideration is known as ………..	M1.03	R
3	Write any one type of section used as tension member.	M1.01	R
4	Plastic neutral axis will divide the cross section into ………. areas.	M2.01	R
5	A joint in the Flange plate in order to increase its length is termed as ……….	M2.04	R
6	According to IS-456:2000 the maximum strain in concrete at the extreme compression fiber is …………	M3.01	R
7	Name the two different classifications of slab.	M3.04	R
8	The compression member whose effective length is less than three times its least lateral dimension is called …………	M4.01	R
9	The part of a structure which safely transmit the loads and moments from the superstructure to the soil is termed as ………….	M4.03	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	Sketch the battened columns.	M1.04	R
2	Define laterally unsupported beams	M2.03	R
3	Find out the plastic moment carrying capacity of a rectangular cross section having breadth 250 mm and depth 400 mm. Take yield stress as 250 MPa.	M2.01	U

4	Write any three types of steel trusses.	M2.04	R
5	Determine the design shear strength of a laterally supported beam having section ISLB 600 @ 995 N/m. Take fy = 250 MPa.	M2.04	U
6	Explain the concept of limit state method of design.	M3.01	U
7	Write down any three values of effective length of columns for various end conditions in terms of unsupported length.	M4.01	R
8	Differentiate long column and short column.	M4.01	R
9	Write the codal provision regarding the spacing of ties provided in columns.	M4.02	R
10	List any three types of footing.	M4.03	R

PART C

Answer all questions. Each question carries seven marks

(6 x 7 = 42 Marks)

		Module outcome	Cognitive level
III	Calculate the design strength of a tension member due to yielding of gross section for ISA 100 x 65 x 10 mm, yield stress is 250MPa.	M1.02	U
	OR		
IV	In a truss a strut 3.2m long consisting of ISA 70 x 70 x 6mm, connected to a gusset plate of thickness 10mm, determine the design strength of the member, if it is connected by welded connection. Take fu = 410 MPa, fy = 250 MPa.	M1.03	A
V	A tie member of a roof consists of ISA 200 x 100 x 12 mm and it is connected to a 12mm thick gusset plate using welded connection. If the length of weld is 260mm. Determine the design strength due to rupture of the net section. Assume fy = 300MPa & fu = 440MPa.	M1.02	U
	OR		
VI	Explain the step-by-step procedure for the design of a compression member.	M1.03	U
VII	Draw the suitable cross section of a plate girder and marks the parts associated with.	M2.04	U
	OR		
VIII	An ISWB 550 @ 1125N/m is used as simple beam over an effective span of 6m, the beam carries a udl of 24 kN/m including self-weight, fy = 250 MPa. Check the safety of the beam in deflection.	M2.04	A

IX	Explain the concept of singly reinforced and doubly reinforced beam sections.	M3.02	U
	OR		
X	Determine the main reinforcement required for a rectangular beam section with the following data (Use SP: 16-1980) Effective span – 8m Live load – 30kN/m Width of the beam = 300mm Overall depth restricted to 650mm Take dc = 50mm, d' = 40mm Use M20, Fe415 grade concrete and steel.	M3.03	U
XI	Determine the ultimate moment of resistance of the beam having dimension as 300 x 550 mm (effective). The beam is reinforced with 1963 mm^2 of steel in the tension zone. Use M20 grade concrete and Fe 250 grade steel.	M3.03	U
	OR		
XII	Design a simply supported roof slab for a room 7.5m x 3.5m clear in size. The slab is carrying an imposed load of 5 kN/m^2. Use M20 grade concrete and Fe 415 grade steel. Take wall thickness as 230mm.	M3.04	A
XIII	An R.C.C short column of size 500mm x 500mm is carrying a factored load of 3000kN. Calculate the main reinforcement in the column. Assuming $emin$<0.05D. Use M25 grade concrete and Fe415 grade steel.	M4.02	A
	OR		
XIV	Write the steps in designing an isolated column footing.	M4.04	U

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