DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, NOVEMBER - 2024

DESIGN OF STEEL AND RCC STRUCTURES

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

PART – A

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**

I.   **Answer all the following questions in one word or one sentence. Each question Carries 'one' marks.**

(9 x 1 = 9 Marks)

Module Outcome Cognitive level

1	Name any two structural steel sections that can be used as Compression member.	M1.01	R
2	Define net area of a tension member.	M1.02	R
3	Write the equation for plastic moment carrying capacity of a section.	M2.01	R
4	Deflection comes under limit state of.......................	M2.04	R
5	The beam sections in which tension steel reaches yield strain before the concrete reaches failure strain is called ....section.	M3.02	R
6	Write the equation to find the development length of the reinforcement in the design of RC beams.	M3.03	R
7	The type of column that fails by crushing is called ....column.	M4.01	R
8	.................% of gross cross sectional area is the minimum area of longitudinal reinforcement that can be provided in a column.	M4.02	R
9	The ratio effective length to the least radius of gyration is known as ……...of a column.	M4.02	R

PART - B

II.   **Answer *any eight* questions from the following. Each question carries 'Three' marks.**

(8 x 3 = 24 Marks)

Module Outcome   Cognitive level

1	Calculate the slenderness ratio of a single angle strut using ISA 100 x 100 x 6mm, assuming that the effective length is 2.55m.	M1.03	U
2	Calculate the plastic moment carrying capacity of a square section of side 100 mm. Take yield stress of steel = 250N/mm^2.	M2.01	U

3	Define (a) Compact section and (b) Plastic section.	M2.02	R
4	Write the equation for finding the design bending strength of a laterally supported steel beam as per IS-800:2007.	M2.04	R
5	Explain laterally supported and laterally unsupported beams.	M2.03	U
6	Sketch the stress block diagram for a simply supported rectangular beam at· ultimate limit state of flexure.	M3.02	R
7	With neat sketch describe any three end conditions of RCC columns that are considered for finding effective length.	M4.02	R
8	List the provisions for providing spacing to lateral ties in the columns as per IS-456:2000.	M4.02	R
9	Differentiate raft footing and combined footing.	M4.03	R
10	Define (a) One way shear, (b) Two way shear.	M4.04	R

PART - C
Answer all the questions from the following. Each question carries 'seven' marks.

(6 x 7 = 42 Marks)

Module Outcome   Cognitive level

III.	Determine the design tensile strength in yielding and rupture for a single angle, ISA 80 x 80 x 6 mm connected to a gusset plate 8mm thick with a fillet weld of 4mm size. Take f_u =410 MPa and fy=250 MPa and the effective length of weld is 140 mm.	M1.02	U
	OR	M1.03	U
IV.	Write the step by step procedure to design of a compression member as per Indian Standards.		
V.	Calculate the strength of a double angle discontinuous strut of effective length 2.55 m consisting of two angles ISA l00 xl00 x8mm (fy=250 N/mm^2) connected at opposite sides of the gusset plate of thickness 10mm.	M1.03	U
	OR		
VI.	Explain laced and battened built up sections with neat sketch.	M1.04	U
VII.	a) Define a plate girder. (2 Marks) b) Sketch the longitudinal section of a plate girder and label the components. (5 Marks)	M2.02	U
	OR		
VIII.	An ISMB400@604.3N/m section is used a simply supported beam to carry a total factored moment of 180kNm and factored shear force of 120kN. If the section is classified as plastic laterally supported, check whether the section selected is adequate in carrying shear and moment. (Z_p, for ISMB 400@604.3N/m is 1176. l 63x10^{3}mm^3 and f_y= 250 N/mm^2)	M2.04	A

IX.	Determine the ultimate moment of resistance of a singly reinforced simply supported beam having a width 230mm and effective depth 400mm. It is reinforced with 4 numbers of 16 mm diameter bars. UseM20 grade concrete and Fe4l5 grade steel.	M3.03	U
	OR		
X.	Write step by step procedure for designing a simply supported two way concrete slab by limit state method.	M3.04	U
XI.	A rectangular beam with width 300mm and effective depth 500mm has to support a factored shear force of 230kN at the critical section near the support. The steel in the tension side of section consists of 4 numbers of 25mm diameter which are continued to the support. Assuming M25 grade concrete and Fe415 grade steel, design the shear reinforcement for the section.	M3.03	A
	OR		
XII.	a) Differentiate one way slab and two way slab. *(3* Marks*)* b) State the purpose of providing distribution steel in one way slab and write the codal provisions for distribution steel. *(4* Marks*)*	M3.04	U
XIII.	Design the main reinforcement for an axially loaded short column of size 400mm x 400mm, pinned at both ends an effective length of 4m for carrying a factored load of 1450 kN. Use M20 concrete and Fe415 steel. If 16mm bars are used as longitudinal reinforcement, calculate the spacing of lateral ties.	M4.02	A
	OR		
XIV.	Explain different types of shallow footings with neat sketch.	M4.03	U

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