Enrollment No: _____ Exam Seat No:_____

C. U. SHAH UNIVERSITY

Summer Examination-2020

Subject Name : Structural Design-I

0Subject Code : 4TE07STD1 Branch: B.Tech (Civil)

Semester : 7 Date : 25/02/2020 Time : 10:30 To 01:30 Marks : 70

Instructions:

(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 Attempt the following questions: (14)

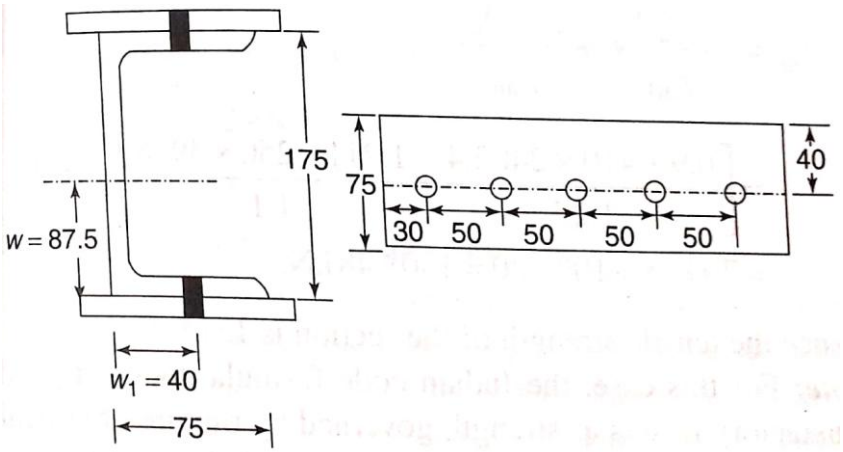
a)	Find the spacing of two legged 8 mm , Fe-250 stirrups is used and V_{us}/d is 230 kN/m.	01
b)	Calculate the flange width of beam for the following data.Depth of flange 200mm, web width 400 mm and effective span is 8000mm.	01
c)	What is load factor in steel structure design?	01
d)	If any steel structure is designed by the plastic theory instead of elastic theory then how much percentage of materials can be saved?	01
e)	The maximum shear stress in a rectangular beam is ……..times of an average shear stress.	01
f)	In doubly reinforced rectangular beam, the allowable stress in compression steel is ……the permissible stress in tension in steel.	01
g)	The assumed overall depth of a T-beam is taken as ……. of the span when it is simply supported at ends.	01
h)	What is the section modulus of square having side “a” with its diagonal parallel to the xx-axis?	01
i)	What is the shape factor of square having side “a” with its diagonal parallel to the xx-axis?	01
j)	What shall be the appropriate minimum diameter of Fe 415? Polygonal links in a rectangular column with 230 mm least lateral dimension and reinforced with only 25 mm .	01
k)	What shall be the appropriate minimum pitch of Fe 415? Polygonal links in a rectangular column with 230 mm least lateral dimension and reinforced with only 25 mm .	01
l)	Draw sketch of six legged stirrups.	01
m)	A cantilever beam of 2 m span is projected from a column of 400 mm width. The cantilever beam is provided with 4 bars of 20mm diameter of Fe-415 grade. Effective cover is 50 mm. Determine the anchorage length. Concrete grade is M20.	01
n)	Draw the sketch of anchorage length for above question.	01

Attempt any four questions from Q-2 to Q-8

Q-2		**Attempt all questions**	**(14)**
	(a)	Design a rectangular reinforced concrete beam section to carry a factored bending moment of 200 kNm, factored shear force of 120 kN, and a factored torsion moment of 75 kNm. Concrete mix grade M20 and HYSD steel of grade Fe-415 are to be used in construction. Consider the ratio of D/b is equal to two.	**10**
	(b)	Find the factored load capacity of column having area 300000 mm^2 with 2% longitudinal steel. Concrete grade M25 and steel grade Fe-415.	**04**
Q-3		**Attempt all questions**	**(14)**
	(a)	For the given data find the type of flanged section based on its neutral axis position.	**07**

Width of flange	=	1500 mm
Depth of beam	=	750 mm
Width of web	=	300 mm
Flange thickness	=	100 mm
Effective cover	=	50 mm
Effective area of tensile reinforcement provided	=	4310 mm^2
Grade of concrete and steel	=	M15, Fe-250

	(b)	Find out the collapse load for a propped cantilever beam subjected to udl over entire span of L (m). intensity of udl is w kN/m.	**07**
Q-4		**Attempt all questions**	**(14)**
	(a)	A column ISHB 300 @ 576.8 N/m is to support a load of 600 kN. The column section is to be spliced at a height of 2.5 m. design the splice plate. Assume f_y = 250MPa.	**10**
	(b)	Describe the behavior of bolted connections using black bolts under increasing load.	**04**
Q-5		**Attempt all questions**	**(14)**
	(a)	Design a header plate connection for an ISMB 400 beam to carry a reaction of 140 kN due to factored loads. The connection is to flange of an ISSC 200 column. Use Fe 410 grade steel (f_y = 250 MPa) and M20 bolts of grade 4.6.	**10**
	(b)	Explain the stress strain curve of concrete.	**04**
Q-6		**Attempt all questions**	**(14)**
	(a)	Proportion and design a reinforced concrete isolated footing for a column of size 450 × 450 mm transmitting an axial load of 1500 kN and uniaxial bending moment of 500 kNm at service state. the soil investigations at the site have indicated that the unit weight, safe bearing capacity and angle of repose of soil are 20 kN/m^3, 150 kN/m^2 and 30º respectively. M20 grade of concrete and FE-415 are used.	**12**
	(b)	Define the slender column in terms of column dimensions.	**02**
Q-7		**Attempt all questions**	**(14)**
		Determine the tensile strength of an ISME 175 when it is connected to gusset plates through the two flanges by two rows of 16 mm bolts with a connection length of 200 mm.	**14**



Q-8 **Attempt all questions** **(14)**

The floor slab of a room with internal dimensions of 5.5 m × 4.0 m is to carry a live load due to flooring, finishing and partitions of 1.5 kN/m^2. Design the slab if it is simply supported on all four edges when the corners are held down. Use M20 and HYSD Fe-415. **14**