KSSEM

K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU-560109

DEPARTMENT OF CIVIL AND ENGINEERING

SESSION: 2023-2024 (EVEN SEMESTER)

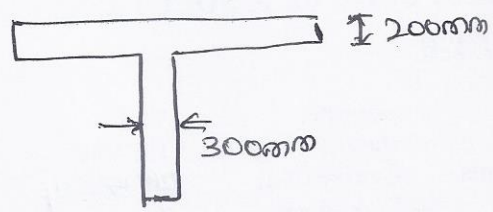
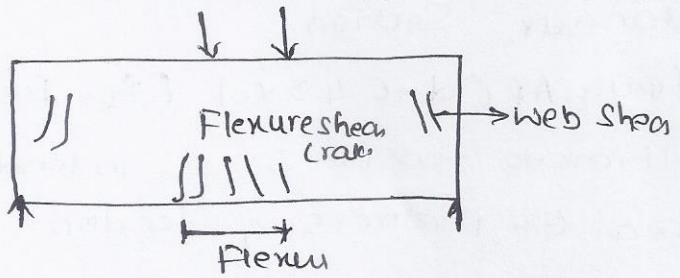
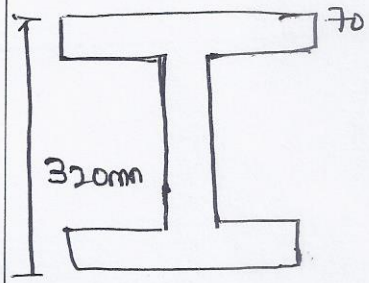
II SESSIONAL TEST SCHEME & SOLUTION

SET-B

Degree	:	B.E	Semester	:	VIII
Branch	:	Civil Engineering	Date	:	18CV81
Course Titl	:	Design of Pre stressed concrete Elements	Course Code	:	06/05/2024
Duration	:	90 Minutes	Max Marks	:	30

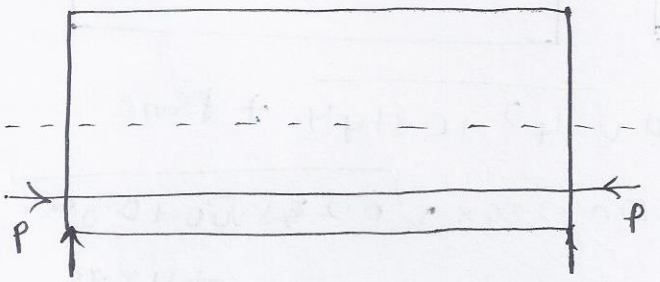
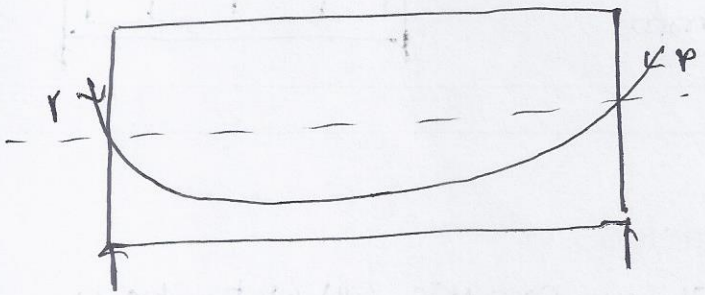
Note: Answer ONE full question from each part

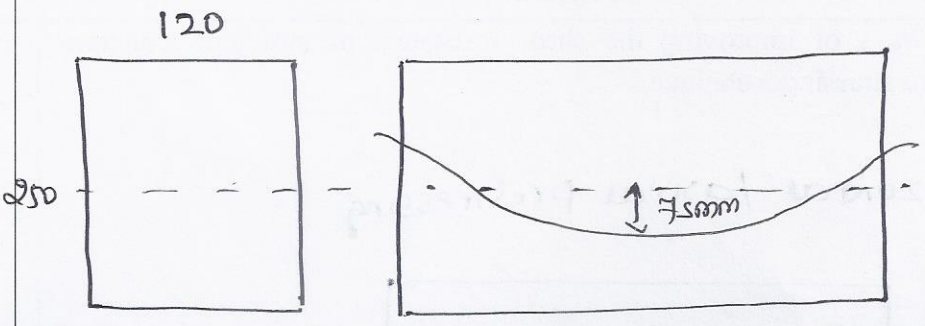
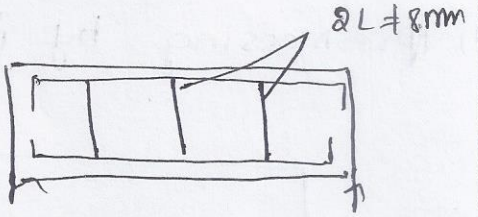
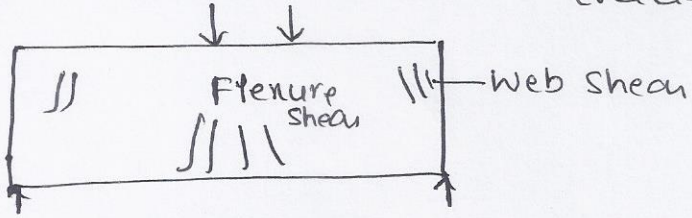
Q. No.	Scheme & Solution	Marks
	PART-A	
1(a)	**Explain** the IS code method of determining the ultimate moment of resistance of rectangular and flanged section PSC members. **Explain** the different types of flexural failures of PSC beams. For Rectangular Section $M_u = f_{pu} * A_p (d - 0.42 x_u)$ (for Rectangular – 01 f_{pu} → ultimate tensile stress in tendon A_p → Area of prestressing tendon 02 d → effective depth x_u → Neutral axis depth $\therefore M_u = f_{pu} A_{pw} (d - 0.42 x_u) + f_{pu} A_f (d - \frac{D_f}{2})$ A_{pw} → Area of prestressing tendon in web 02 A_{pf} → Area of prestressing tendon in flange	

(b)	A post-tensioned bonded pre stressed concrete beam of T section has a flange width of 1500mm and thickness of flange is 200mm. The thickness of rib is 300mm.The area of high tensile steel is 5000mm^2, located at an effective depth of 1800mm. If the characteristics strength of concrete and steel are 40 N/mm^2, 1600 N/mm^2 respectively. **Determine** the flexural strength of T section. 1500  $\frac{A_p f_p}{bd f_u} = 0.08$; $\frac{x_u}{d} = 0.15$ $x_u = 300mm$ $M_u = f_p (A_{pw})(d - 0.42 x_u) + f_f A_f (d - \frac{D_f}{2})$ $= 336.2 \times 10^6$ N-mm	02 03 03 02
	OR	
2(a)	**Explain** the IS code method of determining the ultimate moment of resistance of rectangular and flanged section PSC members (i) Flexure Shear Cracks (ii) Web Shear Cracks  a) Web Shear → Cracks generally from interior Point to local principle Stress b) Flexure Shear Cracks → combined Shear & flex	01 02 01 01
(b)	A Pre-Tensioned PSC beam of I section with 160mmx70mm flanges with thickness of web 50mm and overall depth is 320mm. The beam is pre stressed with 4-HTS wires of 7mm diameter at an effective depth of 265mm. If the characteristics strength of concrete and steel are 40 N/mm^2, 1600 N/mm^2 respectively. **Determine** the flexural strength of I section. 160  $\frac{A_p f_p}{bd f_{cu}} = 0.73$ $\frac{x_u}{d} = 35.6mm$	03 03

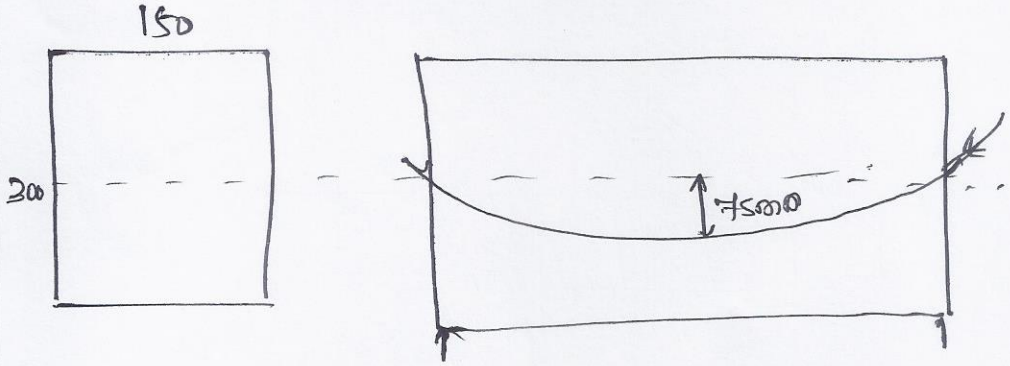
	$Mu = f_{pu} A_p (d - 0.42xu)$ $Mu = 562 \times 10^3$ N-mm	01 03

PART-B

3(a)	**Explain** the ways of improving the shear resistance of structural concrete members by pre stressing technique (i) Horizontal / axial prestressing  (ii) Prestressing by inclined cable 	2.5M 2.5M.

(b)	The support section of pre stressed concrete beam of rectangular section 120mm x250mm,supports a super imposed load of 15kN/m excluding the self-weight spanning over 10m. The cable is parabolic with maximum eccentricity of 75mm at center of span and zero at supports. **Design** the shear reinforcement using IS- code recommendations for the following data. The pre stressing force is 150 kN , f_{ck}= 40 N/mm^2 ,Density of concrete is 24 kN/m^3 and f_y is 415N/mm^2.  $V_c = 0.67bD\sqrt{f_t^2 + 0.8 f_{ck} f_t} + P\sin\theta$ $V_c = 0.67 \times 120 \times 250 \times \sqrt{0.24\sqrt{40} + 0.85 \times 0.24\sqrt{20}} + 4 \times \frac{75}{10}$ $V_c = 60 \times 10^3$ N $\frac{A_{sv}}{S_v} = \frac{V - V_c}{0.87 f_y d}$ $S_v = 150$mm 	02 01 02 03 02
	OR	
4(a)	**Explain** the modes of shear failure. a) Flexural Shear Cracks (ii) Web-Shear Cracks  (i) Web shear: Starts from interior point when local principle stress exceeds. (ii) Flexure Shear Cracks develops when combined Shear & Flexure	01 02 01 01

(b)	The support section of PSC beam (150mmx300mm) is to resist a shear of 100kN. The pre stress at centroidal axis is 5 N/mm^2, f_{ck}= 40 N/mm^2.The cover to the tension reinforcement is 45mm. Check the section for shear and **Design** suitable shear reinforcement ft=1.5 N/mm^2.	



01

$V = 100 KN$

$V_c = 0.67 b D \sqrt{f_t^2 + 0.8 f_{cp} f_t} + P \sin\theta$

02

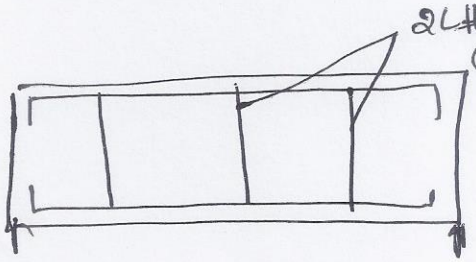
$= 0.67 \times 150 \times 300 \sqrt{1.5^2 + 0.8 \times 5 \times 1.5} + 0.$

03

$= 47.73 \times 10^3$

$V > V_c$

$\frac{A_{sv}}{S_v} = \frac{V_u - V_c}{0.87 f_y}$



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Course In charge | Head of the Department | IQAC coordinator | Principal

Professor & Head
Dept. of Civil Engineering
K.S. Group of Institutions
K.S. School of Engineering & Management
Bangalore-560 062.