APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Scheme for Valuation/Answer Key

Scheme of evaluation (marks in brackets) and answers of problems/key

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: CE401

Course Name: DESIGN OF STEEL STRUCTURES

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

			Marks
1	a)	Any 4 modes of failure with fig– **1.25 marks each – 5marks**	(5)
	b)	Strength of bolt: Shear strength-**2 marks**, Bearing strength-**3 marks** Design strength of one bolt-**1 mark** No of bolts-**2 marks** Fig showing no, arrangement, pitch, and edge distance-**2 marks**	(10)
2	a)	Any six features- **3 marks**	(3)
	b)	Assume weld size = 5mm (between max. and min. values) Assume throat thickness = 3.5mm (between max. and min. values) Length of weld required = 1210mm – **5 marks** Max. length which can be provided = 850mm Balance to be provided by slot welds = 360mm – **2 marks** Let x be the length of one slot weld, 4x = 360, x=90mm, say 100mm – **2 marks** Total length of weld provided = 1250mm Strength of the weld = 835.782kN > 800kN, hence safe. – **2marks** Figure – **1 mark**	(12)
3	a)	Figure **1 mark** Concept of shear lag **2 marks**	(3)
	b)	Determination of Area required for one angle by using the formula. **1mark** γ_{m0} = 1.1 , f_y = 250 , γ_{m1} = 1.25 $T_{dg} = A_g f_y / \gamma_{m0}$ Ag = 1980 mm^2 Selection of suitable trial section from steel table with area more than (1980/2 = 990mm^2). List the properties of trial section from steel table. **1mark** Determination of Bolt Value for double shear As per section 10.3.3 , 10.3.4 of IS 800 : 2007. **1mark**	(12)

Determination of number of bolts = Factored load / Bolt Value **1mark**

Check for Design strength due to yielding of cross section by using the formula > 450kN **2marks**

$$T_{dg} = A_g f_y / \gamma_{m0}$$

Check for Design strength due to rupture of critical section by using the formula:

$$T_{dn} = 0.9A_{nc} f_u / \gamma_{m1} + \beta A_{go} f_y / \gamma_{m0} > 450 \text{ kN}$$

$$\beta = 1.4 - 0.076(w/t)(f_y / f_u)(b_s / L_c) \le (f_u \gamma_{m0}) / (f_y \gamma_{m1}) \quad \textbf{2.5marks}$$

Check for Design strength due to block shear (minimum of below) > 450 kN by using the two formulas : **2.5marks**

$$A_{vg} f_y / \sqrt{3}\gamma_{m0} + 0.9A_{tn} f_u / \gamma_{m1}$$

$$0.9A_{vn} f_u / \sqrt{3}\gamma_{m1} + A_{tg} f_y / \gamma_{m0}$$

Check for slenderness ratio = $l / r_{min} < 350$ (Table 3 of IS 800) **1mark**

PART B

Answer any two full questions, each carries 15 marks.

4 a) Factored load (15)

Area required & selecting section- **3marks**

Spacing and checking design strength-**4marks**

Design of lacing

Size of lacing- **4 marks**

Check- **3marks**

Connection- **1mark**

5 a) Explain slab bases and gusseted base- **5marks** (5)

b) Factored load (10)

Area required & selecting section- **3marks**

Moment at critical section

Finding minimum thickness required- **4marks**

Connection design -**3marks**

6	a)	Laterally restrained beam -2 marks, laterally unrestrained beams -**2 marks**	(4)
	b)	Factored bending moment and shear force-**2 marks**, section modulus-**1 mark**, selection of section and section properties-**1 mark**, section classification-**1 mark**, design bending strength and check-**2 marks**, check for shear-**1 mark**, check for web buckling and web crippling-**2 marks**, check for deflection-**1 mark.**	(11)

PART C

Answer any two full questions, each carries 20 marks.

7	a)	Basic wind speed **(1)** Calculation of K_1,K_2,K_3 **(2 marks)** Calculation of basic wind pressure**. (2)**	(5)
	b)	Forces acting on the purlins. DL and LL calculation **(2),** wind load **(2)** Factored bending moment and shear force **(2 marks each)** Design of section (angle section or I section or Channel section) (**4)** Check for BM and SF**(2)** Check for Deflection. **(1)**	(15)
8	a)	Dimensions of truss with line sketch - **1 mark** Calculation of nodal loads (DL+LL) - **3 marks** Calculation of nodal loads (WL)- **3 marks** Analysis of truss for DL+LL - **3 marks** Analysis of truss for WL- **3 marks** Design Load combinations - **1mark** Design of top chord members **(2 marks)** Design of bottom chord members **(2 marks)** Design of web members **(2 marks)**	(20)
9	a)	L/d **(1)** K **(1)** perm stress of wood from table IS 883**(1)** safe stress **(1)** safe load**(1)**	(5)
	b)	Limiting values for 3 cases **(1 mark each)** and the general equation for deflection from IS 883 with different k values **(2 marks**)	(5)
	c)	Max stress in steel **(3)** stress dg **(2)** MR of timber **(2)** steel **(2)** total MR **(1)**	(10)

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