Total No. of printed pages = 8

Cv-603/SD&D(STEEL)/6th Sem/2018/J/A

STRUCTURAL DESIGN AND DETAILING (STEEL)

Full Marks – 70

Time – Four hours

The figures in the margin indicate full marks for the questions.

Use of IS: 800-1984 and steel tables are allowed after submission of Part-A answer booklet. Detailed drawings are to be shown in the answer booklet only.

PART – A

Marks – 25

1. Choose the most correct answer for each of the following questions : 1×10=10

(i) The yield stress for FE 370-O grade steel is

(a) 350 to 370 N/mm^2

(b) 370 to 390 N/mm^2

(c) 215 to 225 N/mm^2

(d) 250 to 270 N/mm^2

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(ii) The property of material by virtue of which it can be deformed before failure is called

(a) hardness (b) toughness

(c) brittleness (d) ductility

(iii) In case of mild steel the ratio of proportionality limit to elastic limit is almost

(a) 1 (b) more than 1

(c) less than 1 (d) 1.5

(iv) In case of steel the temperature required for fusion is around

(a) 2000 to 2500 °C

(b) 1450 to 1500 °C

(c) 1000 to 1200 °C

(d) 500 to 550 °C

(v) In welding the symbol '◺' is used to indicate

(a) Single bevel butt

(b) Fillet

(c) Single V butt

(d) Plug or slot.

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(vi) Limiting value of slenderness ratio for compression member due to dead and superimposed load is

(a) 350 (b) 300

(c) 180 (d) 250

(vii) 'Maximum Span to Depth ratio' for allowable deflection is

(a) 200 for roof purlin

(b) 250 for cross beam

(c) 325 for building beam

(d) All of the above.

(viii) The pitch of tacking rivet in case of tension member separated by solid spacer should not be more than

(a) 2000 mm (b) 1500 mm

(c) 1000 mm (d) 500 mm

(ix) Minimum length of fillet weld of size 's' is

(a) 20s (b) 10s

(c) 4s (d) None of these.

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(x) The column bases of industrial building are subjected to

(a) bending and compression

(b) compressive and tensile force

(c) bending and torsional force

(d) bearing and compression.

2. State true or false for each of the following statements : $1 \times 5 = 5$

(a) For a given number of rivets and plates chain riveting yields stronger joint than zigzag riveting.

(b) Welding joint is a rigid type of joint.

(c) The effective length of a column whose both ends hinged are more than the actual length.

(d) As per IS-800 the permissible bearing stress in steel beam of Fe 250 grade is 150 N/mm^2.

(e) In gusseted base plate 100% axial load is transferred through the fastenings only.

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3. (A) Fill in the blanks : 1×7=7

(a) Using Unwin's formula the diameter of rivet chosen for connecting two plates of thickness 16 mm and 12 mm is _____ mm.

(b) The maximum shearing force that can be borne safely by a 16 mm power driven shop rivet in double shear is _____ kN.

(c) The maximum size of fillet allowed for joining plates of 12 mm is _____.

(d) The width of slot weld in 12 mm thick plates should not be less than _____.

(e) The number of rivets required to transfer axial tension of 150 kN is _____, whose rivet value is 75 kN.

(f) The net sectional area of a double angle ISA 100 × 100 × 8 mm connected back to back by 16 mm rivet and placed in either side of gusset plate is _____ mm^2 .

(g) The bearing pressure generated below a base plate of 750 mm × 750 mm size carrying column axial load of 2500 kN is _____.

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3. (B) Match the following : ½×6 = 3

(a)	Shank	(x)	concentrated load
(b)	Reinforcement	(y)	stiffner
(c)	Web crippling	(z)	fillet
(d)	Eye bar	(p)	compression member
(e)	Euler's formula	(q)	tension member
(f)	Web buckling	(r)	rivet

PART – B

Marks – 45

Answer any *five* questions from this part.

4. (a) Write four advantages of riveted connection over welded connection. 2

(b) Mention four advantages of steel as a structural material. 2

(c) A triple riveted lap joint is used for connecting two plates 12mm thick. 20 mm diameter power driven rivets have been used in the central row whereas 16 mm diameter rivets are used in outer rows at a pitch of 90 mm. Find the efficiency of the joint. 5

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5. (a) What is a tacking rivet ? What is the maximum recommended value of pitch for tacking rivets in case of compression member of thickness 't'. 2

(b) A tie in a truss consisting of double angle sections 150 × 75 × 10 mm with longer leg connected to the both sides of gusset plate. Design the joint with fillet weld if the joint is to carry a tension of 300 kN. Prepare a freehand drawing of the connection. 7

6. (a) A built up section forming a column of a building consisting of two ISMC 300 placed back to back at a spacing of 200 mm. The effective length of the column is 6 m. Find the maximum load carrying capacity of the column. 7

(b) State the parameters that affect the strength of compression members. 2

7. A simply supported beam carries a superimposed load of 5 kN/m over an effective span of 5 m. The beam rests on brick wall of 300 mm thick. Design the beam for flexure, shear and deflection. Take permissible bending stress as 165 N/mm^2. 3+3+3=9

8. Design a riveted web angle connection for a ISMB 400 beam to carry a reaction of 180 kN due to uniformly distributed load on the beam. The beam is connected to the flange of a column ISMB 500. Use 20 mm power driven rivet. Show the details of connection in freehand drawing. 9

9. An ISHB 200 @ 40 kg/m with cover plates 200 mm × 16 mm is used as a column for supporting an all inclusive load of 1200 kN. Design a gusseted base plate for the column. Take bearing strength of concrete as 4 N/mm^2. 9

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