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Total Number of Pages: 02

B.Tech
PCI51102

5th Semester Regular Examination 2017-18

Design of Steel Structure

BRANCH: CIVIL

Time: 3 Hours

Max Marks: 100

Q.CODE: B261

Answer Question No.1 and 2 which are compulsory and any four from the rest.

The figures in the right hand margin indicate marks.

Q1 Answer the following questions: *multiple type or dash fill up type* (2 x 10)

- a) A laced column is subjected to an axial compressive load of 1000 kN. The transverse shear resisted by the lacing will be: a) 15 KN b) 20 KN c) 25 KN d) 30 KN
- b) The effective length of a weld, is taken as the actual length:
a) minus the size of weld b) minus twice the size of weld c) plus the size of weld d) plus twice the size of weld
- c) Throat thickness of a fillet weld of size 5mm, when the angle between fusion face is 100° (in mm): a) 3 b) 3.25 c) 3.5 d) 4
- d) Net shear area of a 20 mm bolt at thread (in mm^2) is approximately equal to: a) 400 b) 314 c) 245 d) 157
- e) The projections (a, b) of a square slab base of area 160000mm^2 for a column ISHB 350 are : a) 75, 25 b) 50, 25 c) 55, 35 d) 75, 50
- f) Tension member, if subjected to possible reversal of stress due to wind, the slenderness ratio of the member should not exceed a) 180 b) 200 c) 250 d) 350
- g) The size of a butt weld is specified by the effective throat thickness which in the case of incomplete penetration, is taken as: a) $1/2$ of the thickness of thickest part b) $3/4$ of the thickness of thickest part c) $3/4$ of the thickness of thinner part d) $7/8$ of the thickness of thinner part
- h) A column splice is used to increase: a) length of the column b) strength of the column c) cross sectional area of the column d) none of these
- i) Stiffeners are used in a plate girder: a) to reduce the compressive stress b) to reduce the shear stress c) to take the bearing stress d) to avoid bulking of web plate
- j) A horizontal beam along the length of a roof, resting on principals and supporting the common rafters : a) strut b) brace c) purlin d) bent

Q2 Answer the following questions: (2 x 10)

- a) What do you mean by ISMB 300? Explain.
- b) Differentiate between gauge and pitch in a bolted connection joint.
- c) Differentiate between plug weld and slot weld.
- d) Differentiate between single and double lacing system with diagram.
- e) Explain gusseted base for steel column by diagram.
- f) What is *lug angle* and why it is provided?
- g) Define *stanchion, strut and boom*.
- h) State the difference between *slab base* and *gusseted base* for steel columns.
- i) Explain *shear lag effect*.
- j) What is the purpose of providing the *bearing stiffener*?

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Q3 Two plates 250 mm x 16 mm and 250 mm x 8 mm are to be connected by a double cover butt joint with 16 mm diameter bolts. The cover plates are 6 mm thick. The factored tensile load on the connection is 400 KN. Find the bolt value and design the connection. **(15)**

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Q4 The tension member of a truss subjected to a factored tensile load of 850 kN consists of a channel ISMC 350 @ 413 N/m has to be connected to a 10 mm thick gusset plate. The overlap length of the member with the gusset plate is limited to 300 mm. Design the fillet welded connection assuming field welding. **(15)**

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Q5 A tension member of a truss consists of two angles 75x50x6 which are provided on either sides of a 10 mm thick gusset plate. Determine the design tensile strength of the member and the number of bolts required. Use 20 mm diameter bolts in one row for connecting the member to the gusset. **(15)**

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Q6 Design a single angle unequal angle strut 3m long between intersections for a factored compressive load of 50 KN. The member is to be connected at each to 10 mm thick gusset plate with 20 mm diameter bolts of grade 4.6. Take $f_y = 250 \text{ N/mm}^2$. **(15)**

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Q7 A steel column ISHB 400 @ 759.3 N/m is subjected to a factored axial load of 2000 KN. Design a slab base plate for column. Grade of concrete pedestal is M_{20} . The bearing surfaces of column and base plate are machined. **(15)**

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Q8 A simply supported beam of span 3.25 m consists of a rolled steel section ISLB 325 @ 422.8 N/m. Determine the design bending strength of the beam if the beam is laterally unsupported. Assume that the factored shear force is less than the design shear strength. **(15)**

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Q9 Write short notes on any THREE : **(5x3)**

- a) Web crippling and web buckling
 - b) Block shear
 - c) Modes of failures in bolted connection
 - d) Column splices
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