Total No. of Questions : 10]

SEAT No. :

P3560

[Total No. of Pages : 3

[5560]-503
T.E. (Civil)
STRUCTURAL DESIGN- I
(2015 Course) (Semester-I) (301003)

Time : 3 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10***
2) ***Neat sketches must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Take Fe 410 grade of steel***
5) ***Take ultimate stress in bolt, f_{ub} = 400N/mm^2***
6) ***Assume suitabel data, if necessary.***
7) ***Use of electronic pocket calculator IS: 800-2007 and steel table allowed.***
8) ***Use of cell phone is prohibited in the examination hall.***

Q1) a) Explain the terms gauge line, gauge distance, pitch, edge/end distance with sketch. **[5]**

b) A strut consist of 2 ISA 80×80×8 mm @ 9.6 kg/m placed back to back on opposite side of gusset plate is to carry factored load of 275 kN. Design welded connection. **[5]**

OR

Q2) a) State the serviceability condition for tension member, compression member, beam, gantry girder and purlin as per limit state method. **[5]**

b) Check the adequacy of an ISA 90×60×6 @ 6.8 kg/m to carry factored axial tensile load of 150 kN for yielding and block shear only. Assume longer leg is connected to 8 mm thick gusset plate by 4 numbers of M20 bolts. **[5]**

Q3) a) State and explain lacing for built-up column section and bracing in industrial steel structures. **[4]**

b) A column of effective 8 m consist of 2 ISMC 350 @ 42.1 kg/m spaced 220 mm back to back. If the column is restrained in translation but not in rotation at both ends, determine design compressive strength. **[6]**

OR

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Q4) a) Differentiate slab base and gusseted base. **[4]**

b) Design the slab base for a column ISHB 350 @ 66.1 kg/m supporting a factored axial compression of 1500kN. Consider grade of concrete as M20. Take width of base plate as 410 mm. **[6]**

Q5) a) State and explain laterally restrained and unrestrained beam with suitable sketch. **[4]**

b) Calculate safe uniformly distributed load over a laterally unsupported beam ISMB 400@ 61.6 kg/m for an effective length of 6 m. Also check for serviceability. **[12]**

OR

Q6) a) Explain different modes of failure of flexural members with sketches. **[4]**

b) A simply supported beam of span 6 m loaded with uniformly distribute load 25 kN/m including self weight. It also subject to two point load of 50 kN each at quarter span from supports. If the compression flange is laterally restrained, design the section using I section. **[12]**

Q7) a) State and explain types of beam to column connections with suitable sketches. **[4]**

b) A simply supported welded plate girder of span of 24 m subjected to uniformly distributed load 30 kN/m throughout the span including the self weight. Assume compression flange laterally supported throughout the span, design cross section and curtailment of flange plate. **[12]**

OR

Q8) a) State and explain design steps to check of web buckling and web crippling. **[6]**

b) Design a bolted beam column bracket connection to support an end factored reaction of 400 kN from the beam. The column section is ISHB 150 @ 30.6 kg/m. Assume thickness of bracket plate is 10 mm and the eccentricity of end reaction is 250 mm. **[10]**

Q9) a) Differentiate welded plate girder and gantry girder. **[4]**

b) Determine the maximum wheel load, shear force and bending moment for the gantry girder as per the following data. **[14]**

Self weight of crane girder: 200 kN

Capacity of crane :200 kN

Weight of crab and motor: 50 kN

Span of crane girder: 16 m

Minimum hook approach: 1.2 m

Center to centre between gantry column: 8 m

Self weight of rail: 0.3 kN/m

Wheel base = 3.5 m

OR

Q10) a) Differentiate purlin and gantry girder. **[4]**

b) A truss shown in Fig.10 b is used for an industrial building situated at Allahabad covered with AC sheets. Determine panel point dead, live and wind load with following data. **[14]**

Spacing of truss = 8 m

Self weight of AC sheet = 171 N/m^2

Self weight of purlin = 318 N/m

Height of column = 11m

k_1=1.0, k_2=0.89, k_3= 1.0, C_{pe} = -0.8 and C_{pi} = -0.2

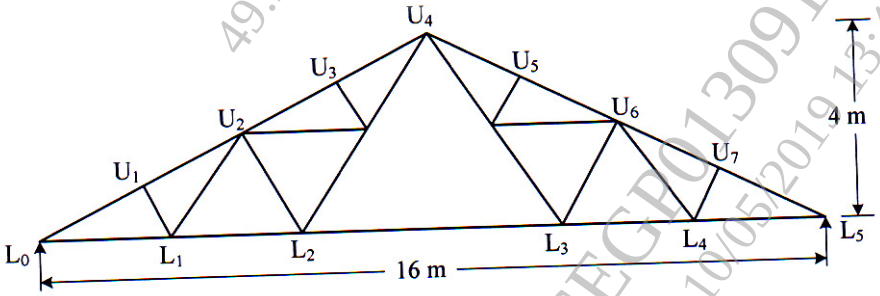

Fig. 10