

Total No. of Questions : 10]

SEAT No. :

P3560

[5560]-503

[Total No. of Pages : 3

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, $f_{ub} = 400 \text{ N/mm}^2$*
- 6) *Assume suitable 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

P.T.O.

- 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/m²

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 $C_{pi} = -0.2$

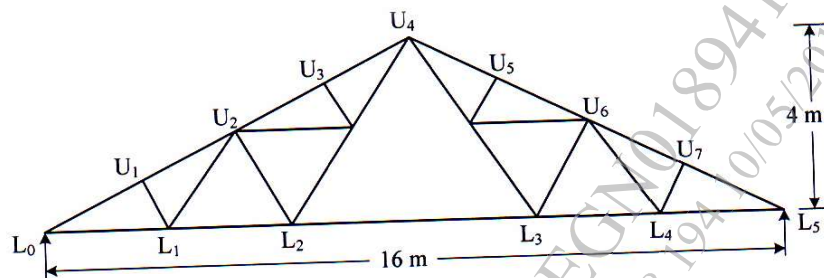


Fig. 10

