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10CV82

Eighth Semester B.E. Degree Examination, June/July 2017
Design and Drawing of Steel Structures

Time: 4 hrs. Max. Marks:100

Note: *1. Answer any ONE full question from Part-A and ONE question from Part-B.*
2. Use of IS800-2007, SP(6)(1)-1984 or steel tables is permitted.

PART – A

1 a. A beam ISLB 400@558.20 N/m is connected to the flange of a column ISHB 300@618 N/m. Another transverse beam ISLB 350@485.60 N/m is connected to the web of column by means of stiffened seated connection. Top of the beams are at the same level. M_{20} bolts of grade 4.6 are used for all connections. Details of bolted connection are as follows:

I. 2 ISA 150mm × 115mm × 12mm are used to connect ISLB 400 with the column by 3 bolts on each leg and 6 bolts in two vertical lines between beam and other leg of angle.

II. Seat angle for ISLB350 – ISA 100×100×10mm
Stiffener angle – 2 ISA 90×90×6 mm with 5 Nos of bolts on each leg connected to web of column. Adopt suitable filler late and pitch = 80 mm.

III. Top cleat angle 90×90×6mm with 2 bolts on each leg is used to connect top flange of two beams to column. Adopt suitable pitch.

Draw to a suitable scale
(i) Sectional elevation along beam ISLB 400@558.2 N/m
(ii) Sectional elevation along transverse beam
(iii) Side view across beam ISLB 400@558.20 N/m. **(20 Marks)**

b. A built up column of height 5.0m, consists of two ISMC 400@484.6 N/m placed back to back at a spacing of 260 mm and provided with single lacing system using 65 F10 flats, inclined at 45°. 6mm fillet weld of length 100mm is required to connect flat and flange of column. Two tie plates of size 400×250mm × 10mm are used at top and bottom of column and are connected to flange of column by 5mm size fillet weld alround. Draw to a suitable scale. (i) Elevation (ii) Sectional plan. **(10 Marks)**

2 a. A column splice is provided between upper story column ISHB 200@ 366 N/m and a lower storey column ISHB 200@366 N/m and a lower storey column ISHB 250@500 N/m. The columns are co-axial. At junction between face of columns a base plate of 40 mm thickness is provided. Four numbers of web cleat angle ISA 100×100×8 mm are used to connect web of column with the base plate using 2 bots along each leg of angles. Flange splice plate of 10mm thick is provided with suitable filler plate. 6 No. of bolts is provided in 2 vertical rows at each flange of column for connection. Two numbers of extra bolts are provided at each face of upper column due to filler plate. All the bolts used for the joints are M_{20} (10k) HSFG bolts. Adopt suitable pitch and edge distance for bolts.
Draw to a suitable scale;
(i) Elevation of column splice (ii) Side view. **(15 Marks)**

b. Draw to a suitable scale sectional plan, front elevation and side elevation of a column with slabbase using following data:
Column – ISHB 350@ 710.2 N/m
Base plate – 650mm × 500mm × 35mm.
Cleat angle – ISA 130×130×8 mm of length 500mm.
Concrete pedestal – 1.20m × 1.00m × 0.70m.
Anchor bolts – 4 Nos of 16mm diameter near each corner of base plate.
4 Nos of M_{20} bolts on each side of flange to connect cleat angle to the column and same nos of countersunk bolts to connect angles to base plate.
Web cleat angle – ISA 75×75×8 mm with 4 mm weld alround (2 Nos). **(15 Marks)**

PART – B

3 Line diagram of a Howe truss with tabulation of member forces are shown in Fig.Q3. Design various member of roof truss along with their end connections with gusset plate of 10 mm thick, by using M_{16} bolts of grade 4.60. The truss rests on 300mm × 500mm size column made of M_{20} grade concrete. Design the support bearing plate, base plate for a reaction of 120 kN and anchor bolts for an uplift force of 18 kN. **(40 Marks)**
Draw to a suitable scale:
(i) Elevation of truss greater than half span.
(ii) Enlarged view of support joint
(iii) Enlarged view of apex joint of truss. **(30 Marks)**

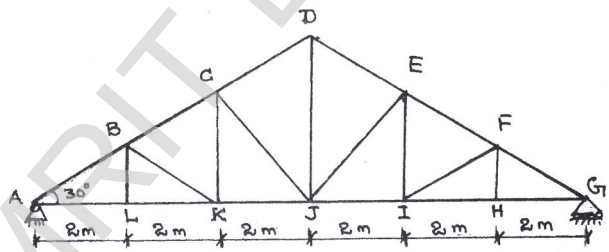

Fig.Q3

Tabulation of member forces.

Members	AB, GF	BC, FE	CD, ED	AL, GH	LK, HI	KJ, IJ	BL, FH	BK, FI	CK, EI	CJ, EJ	DJ
Force(kN)	240	210	160	208	208	182	0	30	15	66	60
Nature of force	C	C	C	T	T	T	-	C	T	C	C

C – Compression, T – Tension

4 Using post critical method design a welded plate girder of 20m span and laterally restrained throughout. It has to support a udl of 60 kN/m throughout the span, exclusive of the self weight. In addition to this girder has to support two concentrated loads of 500 kN at a distance of 5m from either supports. Design the central section, end and load bearing stiffners and their connections, inter mediate stiffeners and their connections, connection between flange and web. **(40 Marks)**
Draw to a suitable scale;
(i) Elevation of plate girder greater than half span.
(ii) Cross section at support
(iii) Cross section at midspan
(iv) Sectional plan. **(30 Marks)**

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