TE/CBCS/VI sem/civil

Paper / Subject Code: 88882 / Design and Drawing of Steel Structure

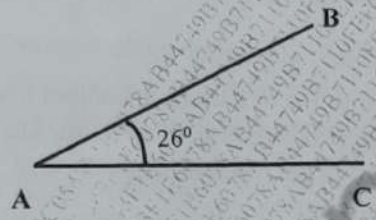
(4 Hours) **[Total Marks: 80]**

- 5 DEC 2019

N.B. 1) **Question No 1 is compulsory.**
2) Solve any **three** questions from remaining questions.
3) Assume suitable data if required but justify same.
4) Use of IS 800 and steel table is permitted in the examination hall.
5) Figures to the right indicate full marks.

Q.1 (a) Design the members, principal rafter AB and main tie AC at joint A of the roof truss as shown in the figure for the following data. Design also fillet welded connection or M16 4.6 grade bolted connection at joint A. Use Fu = 410 N/mm^2 and fy=250 N/mm^2 for member material. Use 2 ISA with equal legs. Sketch the details of the connections. **24**

Sr.no.	Member	Length (m)	Forces due to		
			Dead load (KN)	Live load (KN)	Wind load (KN)
1	AB	2.0	58 (C)	52.5 (C)	125 (T)
2	AC	1.8	52 (T)	47 (T)	115 (C)



(b) Design an I section purlin ,for the industrial building situated in the outskirts of Mumbai, to support a CGI sheet roof for the following data: **8**
Spacing of truss c/c =6m,span of truss =12m,slope of truss =26^0
Spacing of purlins c/c =1.5m, pz = - 1.6 kn/m^2,wt.of CGI sheets =130 N/mm^2
Steel grade fe410.

OR

Q.1 Design a welded plate girder 22 m in span and laterally restrained throughout. It has to support a u d l of 100 kN/m throughout the span exclusive of self weight. Design the plate girder without intermediate transverse stiffeners. Use fu= 410 and fy=250 respectively.

1. Apply check for bending strength. **8**
2. Check for shear capacity of web. **4**
3. One step curtailment of flanges **4**
4. Welded connection between flange and web. **4**
5. Design end bearing stiffener and connection with web. **6**
6. Sketch the fabrication details of the plate girder (plan, elevation and section) **6**

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Q.2 (a) Design a slab base for column ISHB350 @710.2 N/m subjected to a factored load of 1450 kN. The grade of concrete is M15. 6 10

(b) A column ISHB350 @661.2 N/m carries an axial compressive factored load of 1650 kN. Design bolted gusseted base which rests on M15 concrete pedestal. Use M20 4.6 grade for connections. Draw the sketch.
fu=410 mpa and fy= 250mpa for (a) and (b)

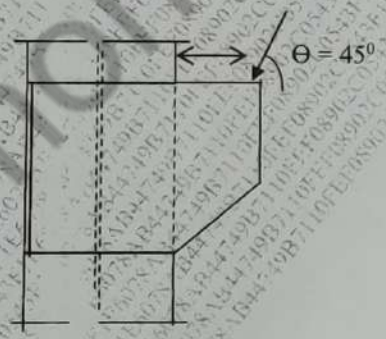
Q.3 Design a built-up column 9m long to carry a factored axial compressive load of 1050 kN.The column is restrained in position but not in direction at both the ends. Design the column with connecting system as battens with bolted connections .Use two channel sections back to back. Use steel grade Fe 410. Draw neat sketch showing details. 16

Q.4 (a) Design a laterally supported beam of effective span 6.1 m for the following data: Factored BM = 150 kN.m, Factored shear force =210 kN. Apply checks for bending strength, shear capacity, web buckling, web crippling etc. Check for deflection is not required. 10

(b) Determine the design bending strength of ISLB 350 @ 486 N/m considering the beam to be (i) laterally supported (ii) laterally unsupported.
The unsupported length of the beam is 3.1 m. Assume steel grade Fe410, low shear Beam. 6

Q.5 (a) An ISLB 300 @ 369.8 N/m transmits an factored end reaction of 300 kN, to the web of ISMB 450 @ 710.2 N/m. Design the bolted framed connection. Steel grade Fe410 and bolts are of 4.6 grade . 8

(b) A bracket plate is used to transfer the factored reaction of a beam to column flange. The bracket plate 10 mm thick, Column section is ISHB 300 @ 576.8 N/m. The Design load is 144 kN located at a distance of 100mm from the column flange. Design the bracket connection using any one of the following:
(i)Fillet weld or (ii) 4.6 grade bolts. 8



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