

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-II Examination July 2010

Subject code: 722007**Subject Name: Advanced Steel Structures****Date: 08 /07 /2010****Time: 11.00am – 1.30pm****Total Marks: 60****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Following IS codes and special publications are allowed
 - i) IS800 : 2007
 - ii) IS875 (Part III)
 - iii) IS1893 (Part I) : 2002
 - iv) SP 1 and or Steel table

- Q.1 (a)** Select appropriate answer and rewrite the sentence : **06**
- i) The slenderness of lacing should not exceed _____
a) 180 b) 145 c) 200 d) 140
 - ii) The maximum lateral deflection allowed in a compression member in industrial buildings with elastic cladding is _____
a) L/250 b) L/325 c) L/150 d) L/240
 - iii) The maximum slenderness ratio permissible in steel ties which may be subjected to compression under wind load condition is _____
a) 250 b) 350 c) 400 d) 180 e) no limit
 - iv) The type of welding used for connecting the member without eccentricity is _____
a) Groove b) Fillet c) Groove or Fillet d) Slot
 - v) The maximum longitudinal pitch allowed in a bolted tension member is _____ (t = plate thk & d = bolt dia.)
a) 16t b) 12t c) 12d d) 16d
 - vi) Prying effect will be more pronounced in _____
a) thin plates b) thick plates
c) intermediate thick plates d) large dia. bolts
- (b)** Write short note on (Any two) : **06**
- a) Unstiffened seat angle connection
 - b) Block shear failure in plates and angles
 - c) Lamellar tearing weld defect
- Q.2 (a)** Design a member of moment resisting frame for following data : **06**
- i) Length = 6.0m
 - ii) Co-efficient of effective length = 0.8
 - iii) Axial load = 200kN
 - iv) Moment about major axis is 80kN-m and 45kN-m at top and bottom end respectively
 - v) Use steel grade Fe-340 N/mm².

- Q.2 (b)** Design a top chord member of N-bridge with effective length of 1500 mm subjected to compressive force of 2575 kN factored load. Assume suitable data. **06**

OR

- (b)** Explain with neat sketch different component of cable stayed bridge and also explain structural configuration with behavior. **06**

- Q.3 (a)** Determine storey lateral forces on 3D steel frame building for office block as per the following data. **06**

Data:

- i) Location : Jamnagar, Gujarat
- ii) Area : Open terrain without obstruction
- iii) Building : Ground + four frame with RCC floor and filler brick partition
- iv) Soil : Medium
- v) Foundation : Isolated foundation
- vi) Dead load : 10.0 kN/m^2 for typical and 7 kN/m^2 for roof.
- vii) Live load : 4.0 kN/m^2 for typical and 1.5 kN/m^2 for roof.

Layout:

- i) 4-bays of 6.0 m in X-direction and
- ii) 3-bays of 5.0m in Z-direction
- iii) All floors with 3.5m storey height

Assume additional data if required.

- (b)** Carry out wind load estimation as per prevailing Indian Standard for the data given in Q.3(a). **06**

OR

- Q.3 (a)** Carry out earthquake load estimation as per prevailing Indian Standard for the data given in Q.3(a) above. **06**

- (b)** Carry out substitute frame analysis for a typical second floor frame along Z-direction. **06**

- Q.4 (a)** i) Discuss the design of fillet welds for truss members. **06**
ii) Select a suitable angle section to carry a factored tensile force of 250kN assuming a single row of M20 bolts and $f_y = 250 \text{ MPa}$.

- (b)** Calculate the compressive resistance of a compound column consisting of ISHB350 @ 72.4 kg/m with one cover plate of 300x10 on each flange and having a length of 4.0m. Assume that the bottom of the column is fixed end and top is pinned. Take $f_y = 250 \text{ MPa}$. **06**

OR

- Q.4 (a)** Find the collapse load for the frame of uniform cross-section shown in fig(i) under the applied factored loads. Also find the minimum section required to resist the applied loads. **06**

- (b)** Design a bolted cover plate splice for a ISHB200 (@ 40 kg/m) column connected to an ISHB200, to transfer a factored axial load of 370kN, both columns are of grade Fe 410 steel. The ends are not machined for full contact in bearing. **06**

- Q.5 (a)** Check the suitability of bracket connection shown in fig (ii). Use 20mm diameter grade 4.6 bolts and plate of Fe 410 steel. The plate is 12mm thick. **06**
- (b)** Design a stiffened seat angle for a reaction of 200kN from a beam of ISMB350 using M20 bolts of grade 4.6. The beam is connected to flange of ISMB400 column. Assume FE410 grade steel ($f_y = 250$ MPa). **06**

OR

- Q.5 (a)** A pratt truss girder through bridge is provided for single broad gauge track. The effective span of bridge is 40 m (10 panels @ 4 m c/c). The cross-girders are spaced 4 m apart. The stringers are spaced 2 m c/c. 0.5 kN/m stock rails and 0.4 kN/m check rails are provided. Sleepers are spaced at 0.4m c/c and are of size 2.8m x 240mm x 240mm. The main girders are provided at a spacing of 7m c/c. Height of truss is 5 m. Analyse the member force (design force) due to dead loads and Live + Impact loads in top chord member. For live load, EUDIL = 3500 kN for each track. CDA = 0.324. **06**
- (b)** Enlist factors affecting mechanical properties of steel. Sketch stress vs Strain plot for ordinary and high-strength steel with important points marked on it. Enlist various mechanical properties of structural steel as per IS800 : 2007 **06**

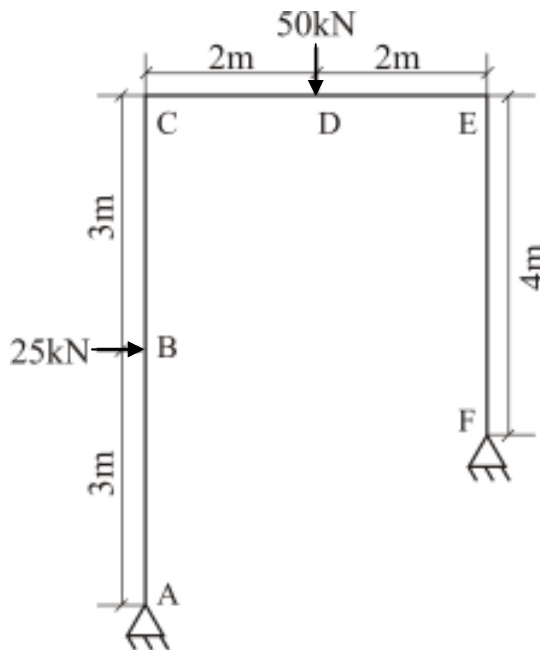


Fig (i)

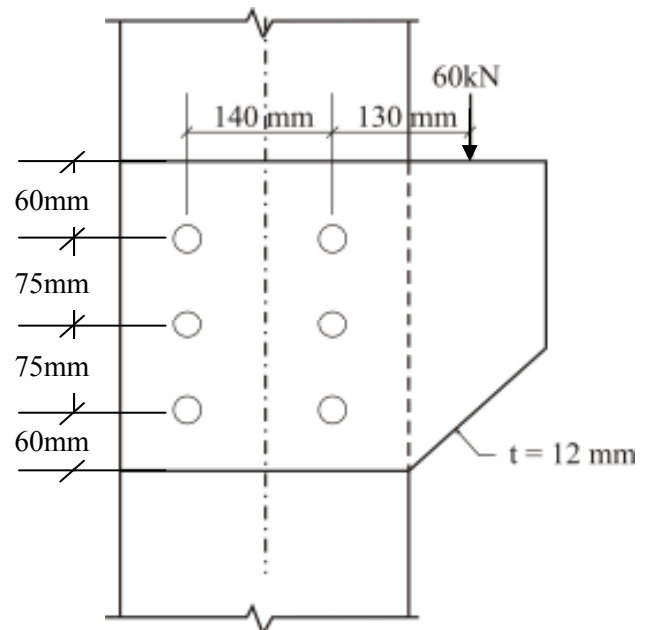


Fig (ii)
