

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS- 2016

M.Tech II Semester

COURSE CODE: 11M1WCE212

MAX. MARKS: 35

COURSE NAME: Design of Steel Structures

COURSE CREDITS: 4

MAX. TIME: 2 HRS.

Notes: All questions are compulsory.

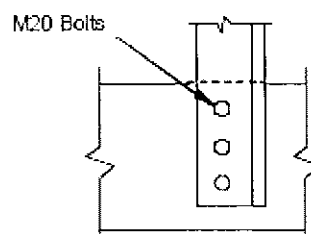
Carrying mobile phone during examinations will be treated as case of unfair means.

Illustrate your answers with **neat sketches / free body diagrams** wherever necessary.For any missing data or information, you are free to make whatever simplifying assumptions that you wish, **provided you supply a credible justification.**Cite the appropriate **clause no., table no. and figure no. from IS codes**, wherever it is required.Assume the loads are given as **factored**, unless noted otherwise.Preferably, write the answers in sequential order. **IS 800: 2007, IS 1161: 2014, IS 808, Steel Table is allowed.****Question 1. Answer the following questions in brief:****[5 X 2 Marks = 10 Marks]**

- What do you understand by P- Δ and P- δ analysis?
- Explain significance of **Notional Horizontal Loads** in structural analysis.
- Provide a neat and clean sketch of beam to column connection, where **beam is fully restrained against torsion and only compression flange is restrained against warping.**
- Describe how **block shear failure** can occur in a steel girder.
- What do you understand by **inelastic buckling**? Explain how inelastic buckling is taken into consideration in IS 800:2007.

Question 2.

What tensile load can an ISA 100 X 100 X 10 carry with the connection shown in the following figure (**Fig. 1**)? Assume that the connection is stronger than the member connected. For the given bolted connection, the edge distance is 35 mm, pitch is 50mm and gauge distance is 60 mm from the outstanding leg of the angle.

[5 Marks]**Fig. 1**

For the truss structure shown in the following figure (**Fig. 2**), a ISWB 250 @ 40.9 kg/m is used as a continuous top chord member (rafter). The top chord shown as AB in the figure is subjected to a factored axial force of 600 kN and a transverse factored load of 50 kN (representing the effect of a purlin). The member AB can be considered fixed at B pin supported at A. The beam is laterally supported at the purlin locations only. Comment on the adequacy of the member to resist the factored loads as shown.

Question 4.

Design the base plate for a circular tube post with NB 350 section to transfer a factored axial load of 1200 kN and shear force of 250 kN. The thickness of the tube is given as 12 mm. Assume Fe 410 grade steel for base plate and M20 grade of concrete for RC pedestal. Provide details of column to base connection in a neat and clean sketch. [4 M]

Question 5.

The frame shown in the following figure (*Fig. 3*) is unbraced against side sway. Assume all columns are ISHB 400 @ 77.4 kg/m and all beams are ISMB 400 @ 61.6 kg/m. Determine the factored load that can be safely carried by column GH. Assume that columns are oriented in such a way that major axis buckling occurs in the plane of the frame and buckling about minor axis is fully restrained by the wall panel in the out- of plane direction. Also assume that the beams are subjected to bending moments and shear forces only and bends about major axis. [8 M]

The diagram shows a frame structure with four vertical columns and three horizontal levels. The columns are labeled A, H, I, and P at the base and C, F, K, and N at the top. The horizontal levels are labeled B, G, J, and O. The dimensions are as follows: horizontal spacing between columns is 8 m (D-F, F-L, L-M); vertical spacing between levels is 4 m (B-G, G-J, J-O). The joints are labeled A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P. The structure is supported by pin supports at A, H, I, and P.

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