

7E7062	Roll No. _____	[Total No. of Pages : 4]
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	<p>B.Tech. VII Semester (Main) Examination Dec. - 2015</p> <p>Civil Engg.</p> <p>7CE2A Design of Steel Structures - I</p>	

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 24

Instructions to Candidates:

Attempt any **five** questions, selecting one question from **each unit**. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. I.S.800-2007
2. Steel tables (Struct. Engg. Hand Book P&I)

Unit - I

1. a) Enumerate types of steel. Which steel is used in structures and why? (4)
- b) State statical and kinematical theorems for plastic analysis (4)
- c) Using mechanism method or otherwise. Calculate the collapse load for a fixed beam shown in fig 1. (8)

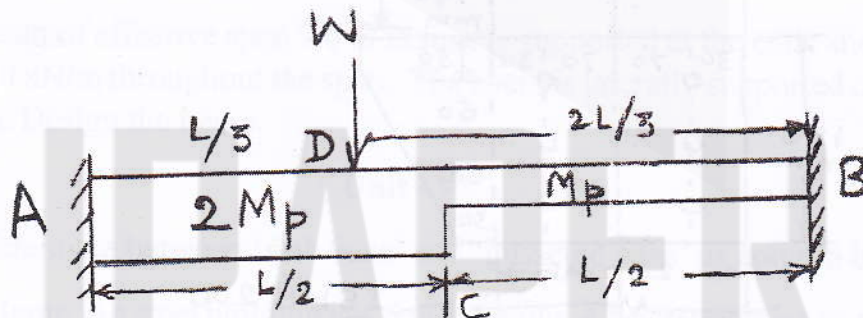
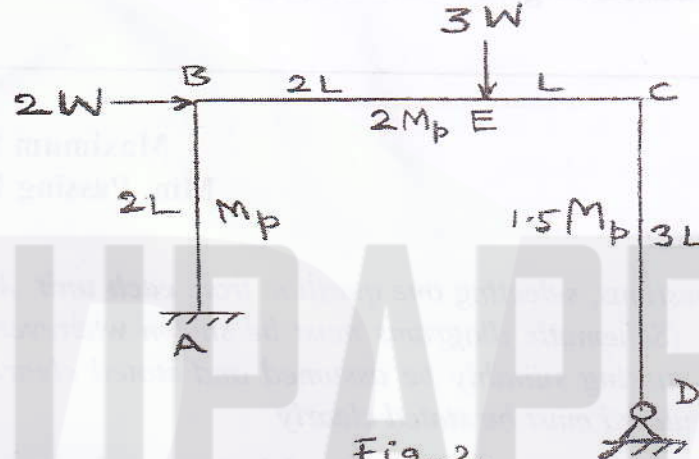


Fig. 1

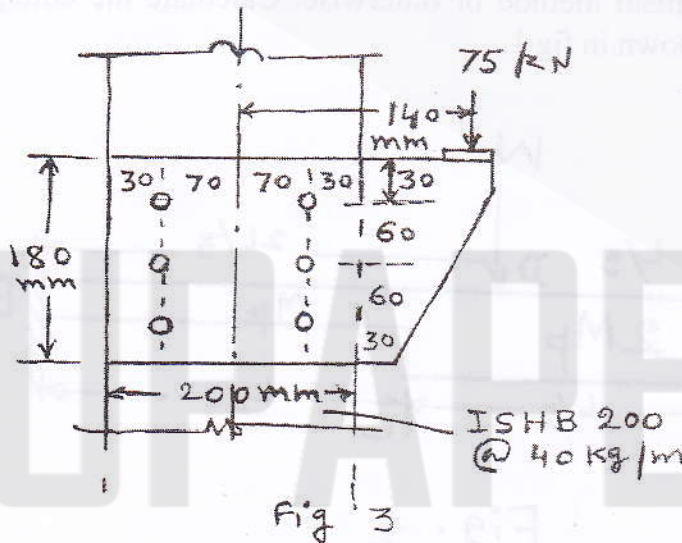
OR

1. a) Determine the shape factor for a diamond section (4)
- b) Compute the true value of collapse load for the portal frame loaded as shown in Fig 2. Comment on the type of failure. (12)



Unit - II

2. a) Design the welded joint for a single angle section ISA 100×100×8 mm with a gusset plate 10 mm thick, using shop welds of size 6mm, along the end and both sides. The member carries an axial factored load of 200 kN. (4)
- b) A plate bracket connection is shown in fig 3. A factored load of 75 kN acts at 140 mm from the centroidal axis of column. There are 6 bolts of grade 4.6 of diameter 18mm. Make calculations to show, whether the design is safe. (12)



OR

2. a) What is prying action? How it is accounted for? (4)
- b) Design a single angle section for a tension member to carry a factored axial load of 225 kN. Use 20 mm dia. Shop bolts with $f_{ub} = 400 \text{ N/mm}^2$. Draw the neat sketch of the joint. (12)

Unit - III

3. a) What are buckling classes and how do they affect compression carrying capacity of the column section. (4)
- b) An ISHB 250 @ 51.0 kg/m is strengthened by welding a plate 300mm \times 10mm to each flange symmetrically. Find the design factored maximum axial compressive load which the section can take safely, if it is 3.0 m long. Its both ends are restrained against position but not against direction. (12)

OR

3. A Built up column is to be designed for an axial factored load of 1400 kN. Taking two ISLB or ISMB sections, placed side by side, design the column if it is 4.0 m in length. The column is hinged at top and fixed at bottom. Also design a system of battens for the column. (16)

Unit - IV

4. a) What do you understand by terms 'web buckling' and 'web crippling'. (4)
- b) Design a laterally supported beam having effective span 6.0.m. The beam is simply supported at the two ends and carries a uniform by distributed factored load of 30 kN/m, including its self weight. (12)

OR

4. a) Write a short note on lateral torsional buckling. (4)
- b) A beam of effective span 7.0 m is simply supported at the ends and is loaded by 20 kN/m throughout the span. The beam is laterally supported only at mid span. Design the beam. (12)

Unit - V

5. a) Differentiate between 'slab base' and 'gusseted base' as column bases (4)
- b) A column in a steel building is 4.5 m in height. A beam transfers its reaction of 400 kN at an eccentricity of 80 mm from the major axis of the section. Check whether the section ISHB 300 @ 58 kg/m is satisfactory. (12)

OR

5. A column consists of the section ISHB 400 @ 82.16 kg/m. It carries an axial compressive factored load of 1800 kN. The column rests symmetrically on a square base plate of size 750 mm × 750 mm. Design a two tier grillage foundation for the column. The bearing capacity of the soil may be taken as 140 kN/m². (16)

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