

THE PNG UNIVERSITY OF TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING
FIRST SEMESTER SUPPLEMENTARY EXAMINATIONS – 2022

CE 311 – Design of Steel Structures

Date	Thursday, 14th July 2022
Time	8:20 am
Venue	Learning Centre
Time Allowed	3 hours

Instructions to Candidates

1. You have 10 minutes to read the paper. You must NOT begin writing during this time.
2. Answer any four (4) questions out of the seven (6) questions given.
3. Open Book (Notes; Design Standards; Section Tables; other references are allowed)
4. All answers must be written in the answer book provided. No other written material will be accepted.
5. Write your name and Student Id number clearly on the front page of the answer book. **Do it NOW.**
6. **Marking Scheme**
All Questions carry equal Marks.

1. Reference:

One Steel section properties.

2. Useful Information

Deflection Equations

Central Point Load, Deflection = $PL/48EI$

UDL, Deflection = $(5*w*L^4)/(384*EI)$

QUESTION ONE

General Short Answer Questions

- a) Differentiate between the Limit States Design Philosophy and the Permissible Stress Design Method.
- b) Briefly state the Activities of the Preliminary Design Phase of the Design Process.
- c) Briefly state how fire resistance is allowed for in the design of steel structures.
- d) Describe what the Serviceability Limit State is.

QUESTION TWO

Design a Tension Member

Select a single angle section from the One Steel section properties table to carry a dead load of 300 kN and a live load of 600 kN, both in Tension. Assume all holes are filled. Length of member is 3m. Self-weight of the member is already included. Steel grade is 300 MPa.

QUESTION THREE

Design a Compression Member

Select a column section (UC) to carry an axial dead load of 600 kN and an axial live load of 1,000 kN. Column is 6m long and is pinned at top and bottom in both directions. Steel grade is 300 MPa.

QUESTION FOUR

Design a Beam member

- a) i) Describe the differences between a Compact, and ii) a Non-compact steel sections and their characteristic features are.
- b) A simply supported beam with a span of 5m is loaded by a central concentrated live load Q of 30 kN. The beam is fully restrained against lateral displacement and twist rotation only at the supports, and is free to rotate in plan (i.e. No restraint against lateral rotation exists at the supports). Design a suitable UB section of Grade 300 steel.

QUESTION FIVE

Beam-column

- a) Describe what a Beam-Column member is.
- b) Select a column (UC) to carry an: axial dead load of 300 kN; axial live load of 500 kN; and, a uniform moment of 100 kN.m. Column is 5m long and is pinned at top and bottom in both directions. Steel grade is 300 MPa.

QUESTION SIX

Beam-Tie

- a) Describe what a Beam-Tie member is.
- b) Select a single angle (EA or UA) section from the One Steel section properties table to carry: a dead load of 300 kN; a live load of 600 kN (both in Tension); and, a uniform moment of 100 kN.m. Assume all holes are filled. Length of member is 5 m. Steel grade is 300 MPa