THE PNG UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

FIRST SEMESTER EXAMINATIONS – 2022

CE 413 – Design of TIMBER Structures

Date	**Wednesday, 8th June 2022**
Time	**12:50pm**
Venue	**SLT**
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 (7) questions given.
3. Open Book Examination. Bring all required references to the exam room.
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, for a total of 40 marks.

References:

1. Timber section properties tables.
2. PNGS 1292-1989
3. Class Notes

QUESTION ONE General short answer questions

a) Describe how the stability of a flexural rectangular member is taken care of in design.
b) Differentiate between the Limit States Design Philosophy and the Permissible Stress Design Method.
c) Briefly state the Activities in the Final Design Phase of the Design Process.
d) Briefly state what the Code of Practice PNGS 1292 - 1989 is in design of Timber structures.
e) Describe what the Strength Limit States is.
f) Describe what the Serviceability Limit State is.
g) Differentiate between Dead Load and Live/Imposed Load.

QUESTION TWO Design a Tension Member

a. Describe what a timber tension member is and what its characteristics are.
b. Select a section from the timber section properties table to carry a dead load of 60 kN and a live load of 100 kN, in Tension. Length of member is 3m. Self-weight of the member is already included. Use seasoned Kamarere, select structure grade.

QUESTION THREE Design a Compression Members

a. Describe what a timber compression member is and what its characteristics are.
b. Select a column section to carry an axial dead load of 200 kN and an axial live load of 300 kN. Column is 6 m long and is pinned at top and bottom in both directions. Use partially seasoned Hopea, common building grade, with MC of 26%.

QUESTION FOUR Design a Beam member

a. Describe what a Flexural member is and its characteristics are.
b. A simply supported beam with a span of 5m is loaded by a central concentrated live load Q of 60 kN, and a UDL of 2 kN/m. Design a suitable Timber section. Use partially seasoned Busu-Plum, normal structure grade at 26% MC.

QUESTION FIVE Beam-Column member

a. Describe what a beam-column is and its characteristics.
b. Design a column to carry an: axial dead load of 50 kN; axial live load of 500 kN; and, a uniform moment of 10 kN.m. Column is 8 m long and is pinned at top and fixed at bottom in both directions. Use partially seasoned Tulip-Plum, select structure grade at 28% MC.

QUESTION SIX — Beam-Tie member

a. Describe what a beam-tie member is and its characteristics.

b. Design a tension member to carry: a dead load of 60 kN; a live load of 100 kN (both in Tension); and, a uniform moment of 10 kN.m. Use Green PNG Vitex, Common Building grade.

QUESTION SEVEN — Joints/Connections

a) List and briefly state the different types of failures of a bolted joint.

b) How is a multi-shear joint ensured in the design and its fabrication/construction?

c) What is the most important consideration in the design of a timber joint?