

CARLETON UNIVERSITY

*JLH*

**FINAL  
EXAMINATION  
DECEMBER 1994**

**DURATION: 3 HOURS**

No. of Students: 28

Department Name & Course Number: **82.324 Introduction to Structural Design**

Course Instructor(s) **Professor J.L. Humar**

AUTHORIZED MEMORANDA  
**None**

Students **MUST** count the number of pages in this examination question paper before beginning to write, and report any discrepancy immediately to a proctor. This question paper has **5** pages.

This examination question paper **MAY** be taken from the examination room.

**Notes:**

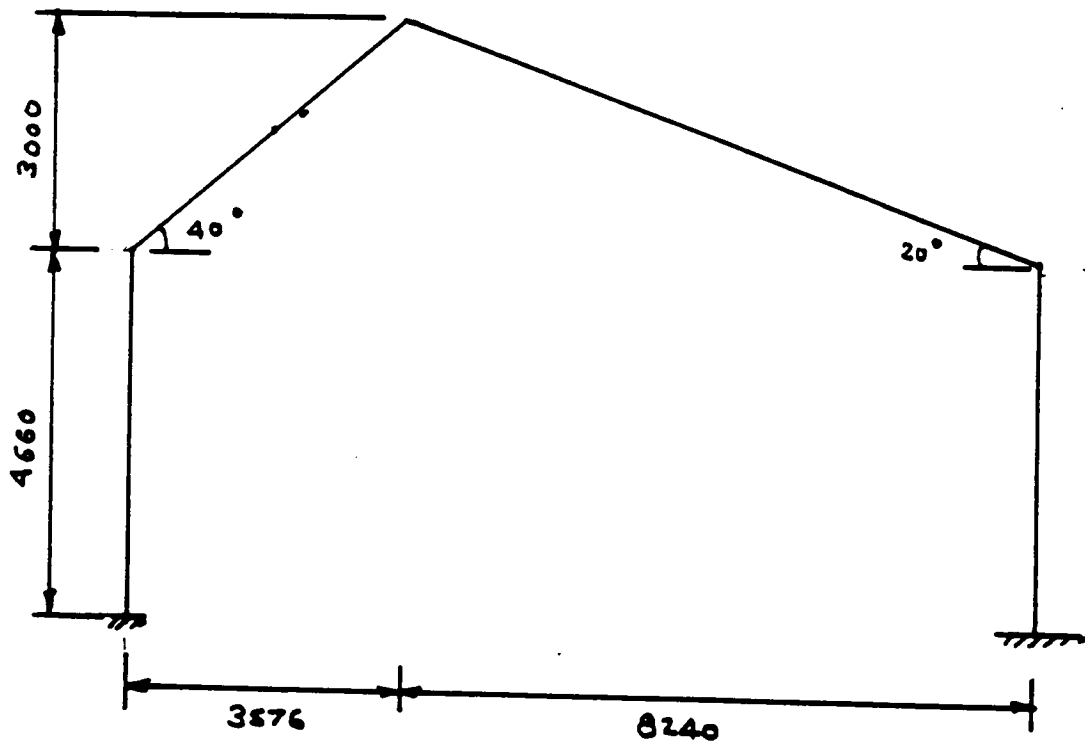
- (1) All books and notes and a calculator permitted.
- (2) Attempt all questions.
- (3) If a question appears incomplete, make suitable assumptions based on engineering judgement and proceed. State your assumptions *clearly*.

**Question 1**

Determine the wind forces to be used in the strength design of a single storey structure located in Nelson, British Columbia. The structure has the profile shown below and is 36.4 m long. Consider the building to fit category 2 for the calculation of internal pressures. The structure consists of load bearing brick walls with timber trusses.

Indicate the external and internal wind pressures on a profile of the building for both the end and interior zones. Identify the extent of the end zone.

Consider the wind as blowing perpendicular to the ridge either from the left or the right, as well as wind blowing parallel to the ridge. You will need to draw more than one diagram to show all wind load cases.

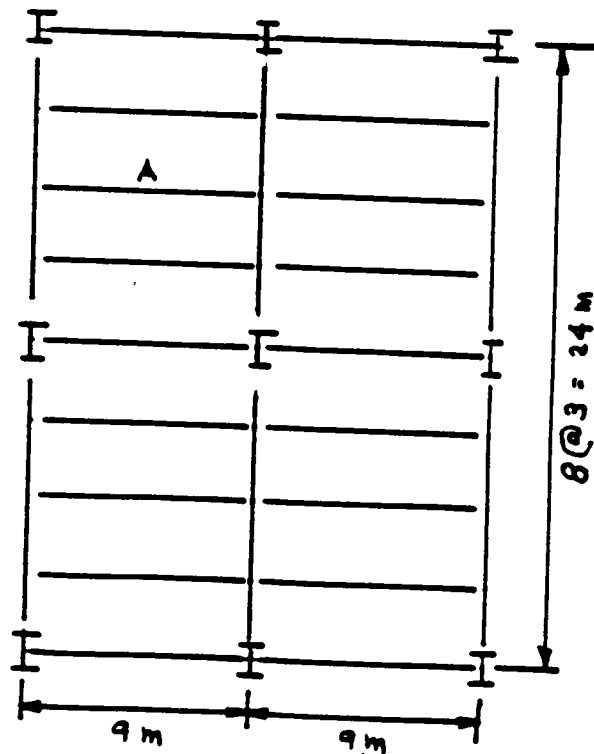
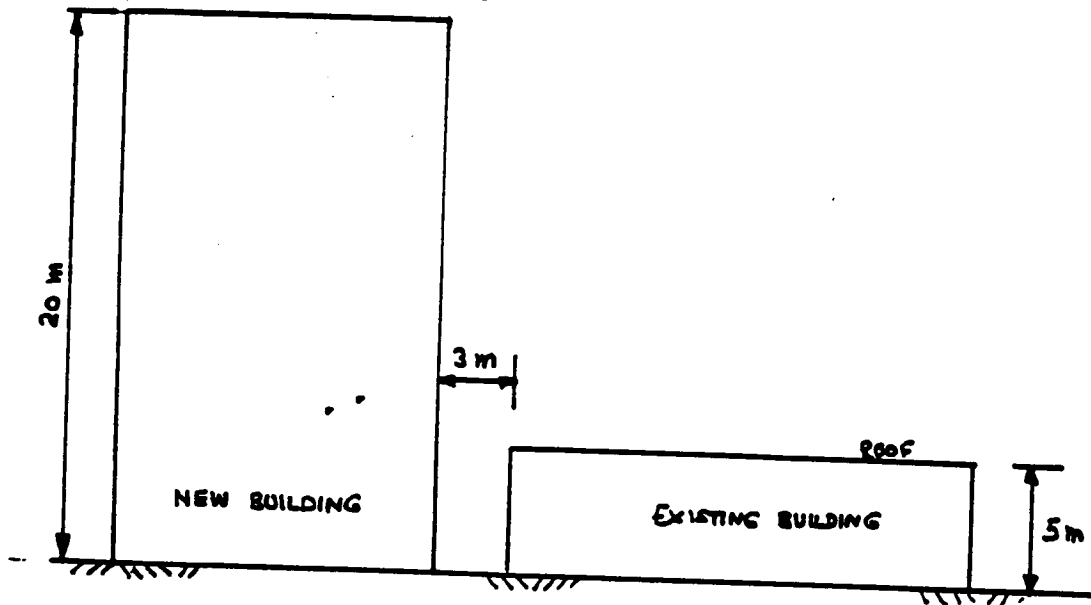


Question 2

A small building located in Ottawa is shown in plan and elevation. The roof of the building has been designed for a specified dead load of  $1.05 \text{ kN/m}^2$  and sheltered snow condition.

It is planned to construct a 20 m tall building next to the existing building. The clearance between the two buildings will be 3 m as indicated.

Find the factored design shear and moment for beam A in the existing building before and after the construction of the taller building.



ROOF PLAN

**Question 3**

The plan and elevation of a steel building located in Ottawa, Ontario are shown. Calculate the following.

- (a) Factored design moment and shear for beam B1 in an office floor.
- (b) Factored design moment and shear for girder G1 in an office floor.
- (c) Factored axial design load for column C1 between floors 1 and 2.

The following loads are specified.

specified dead load

Roof	1.7 kN/m <sup>2</sup>
Office floor	3.5 kN/m <sup>2</sup>
Retail floor	3.75 kN/m <sup>2</sup>

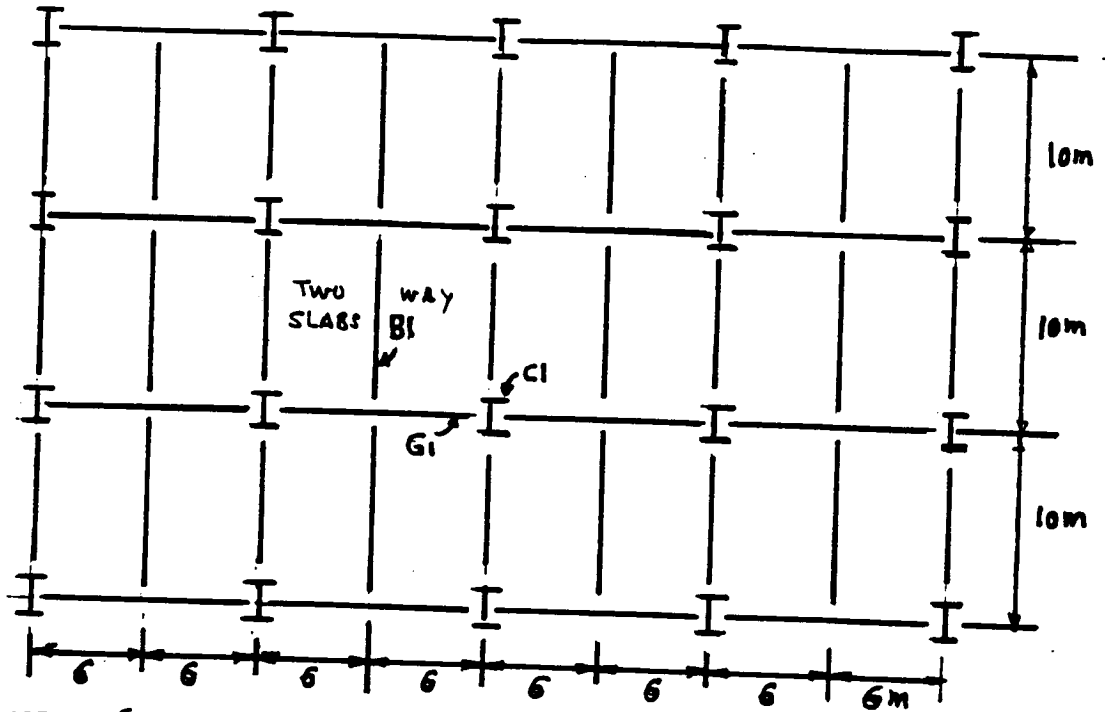
specified live load

Roof snowload	2.3 kN/m <sup>2</sup>
Office floor	2.4 kN/m <sup>2</sup>
Retail floor	4.8 kN/m <sup>2</sup>

Allowance for self weight of structural steel members has already been made in the above loads. No allowance need be made for moveable partitions.

The top of the beam and girder are at the same level.

*JL*



NOTE: CONSIDER FLOOR AND ROOF SLABS AS TWO WAY SLABS

