NOTES

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper a clear statement of any assumptions made.

2. This is a "CLOSED BOOK" examination. Any textbooks are permitted as well as Design handbooks. No notes or sheets are allowed. Candidates may use one of two calculators, the Casio or Sharp approved models.

3. Solutions must be to the following standards:

   Steel: CSA-S16 (latest edition)
   Concrete: CSA-A23.3 (latest edition)
   Timber: CSA-O86 (latest edition)

4. A total of five solutions is required. Only the first five as they appear in your answer book will be marked.

   Do two questions from Part A.
   Do two questions from Part B.
   Do the one question in Part C.

5. All questions are of equal value.

6. All loads shown are unfactored.

Marking Scheme:

A1. (10 + 10)
A2. (8 + 12)
A3. (12 + 8)
B1. (10 + 10)
B2. (12 + 8)
B3. (12 + 8)
C1. (10 + 5 + 5)
Part A (Do two of three questions)

A1. Figure A1 shows a determinate steel frame constructed of two parts, column AB and beam BC, bolted at B. Design the bolted connection. [Ignore self-weight].

A2. The steel column AB is Figure A1 is loaded as shown. Check the design of the steel column, AB.

A3. The cross-section of a steel member is shown in Figure A2. The section is made from G40.21 350W steel plates, 20 mm thick. Determine the section moments of resistance about the two axes, a-a and b-b.

Part B (Do two of three questions)

B1. The cross-section of an r.c. culvert is shown in Figure B1. Determine the moment and shear resistances of the section. Use $f'_c = 35$ MPa and $f_y = 400$ MPa.

B2. The reinforced concrete determinate frame in Figure B2 is loaded as shown. Design a cross-section and the reinforcing steel for beam-column AB. Ignore self-weight. Use $f'_c = 35$ MPa and $f_y = 400$ MPa.

B3. Design a reinforced concrete rectangular section for beam BC in Figure B2. Determine the quantities of reinforcing steel for moment and shear. Show the arrangement of the steel. Use $f'_c = 35$ MPa and $f_y = 400$ MPa.

Part C (Do question C1)

C1. Single span oblique sawn timber purlins are required for a roof. Using untreated D. Fir-L select structural grade, in dry service conditions, design the purlins to satisfy the following conditions: Purlin spacing = 2.5 m; Purlin span = 5.5 m, Roof pitch = 20.0°

Specified dead load (including weight of purlin) = 1.0 kPa;
Specified live load = 2.0 kPa.

[Assume any other data that may be required.]