

National Examinations May 2009

04-For-A3, Transportation of Forest Products

3 Hours Duration

Notes:

1. If doubt exists concerning the interpretation of any question, the candidate is urged to make assumptions and clearly explain what has been assumed along with the answer to the question.
2. The examination is closed book. As a consequence, candidates are **not** permitted to make use of any textbooks, references or notes.
3. The use of one of two calculators is permitted, the Casio or Sharp approved models.
4. The answers to three groups of questions, from Part A either 1.1 to 1.3 **or** 2.1 to 2.3 **and all** questions from Part B, comprise a complete examination.
5. Candidates must indicate the answers that they wish to have graded on the cover of the first examination book. Otherwise the answers will be graded in the order in which they appear in the examination book(s) up to a maximum of one group of questions in Part A and all questions in Part B.
6. The answer to any question carries the same value in the grading.

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Part A

1. Transportation modes

- 1.1 List and describe the forest transportation modes in Western, Eastern and Atlantic Canada. (50)
- 1.2 Give reasons for the use of different modes in the regions.(50)
- 1.3 Explain the pros and cons of A-, B-, and C-trains concerning vehicle stability and other important issues.

2. Road classification systems

- 2.1 Why is it advantageous for forest industry to classify forest roads?
- 2.2 Name and describe the different classes of an official road classification system for low volume roads.
- 2.3 You are asked to come up with a new forest road classification system. Name and explain criteria you would include to characterize different road classes.

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Part B

3. Horizontal and vertical road alignment

- 3.1 List elements which need to be considered during the horizontal and vertical design of a forest road. Quantify these elements and give typical numbers for a secondary road in hilly terrain.
- 3.2 Give a short definition of stopping sight distance. Name and explain the two main elements of the stopping sight distance. Explain factors affecting the stopping sight distance.
- 3.3 Name and explain road and vehicle characteristics you need to know in order to design a crest vertical curve.

4. Gradeability

In a simple model gradeability is explained by $\tan \theta \leq f$

- 4.1 Draw a free body diagram of a wheel on a gradient and indicate the acting forces when the wheel is just about to spin. Give the sum of forces in x and y direction.
- 4.2 Explain how $\tan \theta \leq f$ is derived from the forces in x and y direction.
- 4.3 Explain f and give a reasonable number for f of a forest road.
- 4.4 Apply your assumed f within $\tan \theta \leq f$. What would be the maximum allowable road gradient (in %) before the wheel starts to slide or spin according to this simple model?

End

Marks

Part A

1.1 10 marks total

1.2 10 marks total

1.3 10 marks total

Alternatively to 1.1 to 1.3:

2.1 10 marks total

2.2 10 marks total

2.3 10 marks total

Part B

3.1 10 marks total

3.2 10 marks total

3.3 10 marks total

4.1 10 marks total

4.2 10 marks total

4.3 10 marks total

4.4 10 marks total

Maximum achievable marks: 100