Department of Forest Products Technology

Puu-28.3001 Material Properties of Wood

Examination 25th October 2010

Total Marks 40

1. Explain briefly the following terms (use a diagram support your answer if necessary): ***(5 marks)***

   i. "Young's modulus"
   ii. "Resilience"
   iii. "Microfibril"
   iv. "Equilibrium moisture content"
   v. "Toughness"

2. Draw and label a schematic diagram of the wood cell wall, explain the arrangement of the microfibrils in each of the layers and comment on the functions of each of the cell wall layers ***(7 marks)***

3. Answer all of the following: ***(8 marks)***

   a) What do you understand by the term "fibre saturation point"? Explain how this point might be determined experimentally and comment on possible inaccuracies in its determination
   b) Using a diagram, show how the adsorption and desorption isotherms in wood differ
   c) What is meant by fatigue? Explain what happens to wood during fatigue and how it might affect the properties of wood. Further, give one example of where fatigue in wood might be problematic
   d) Name one form of micro-structural defect and one form of macro-structural defect in wood and explain how each may affect the properties of wood

4. Answer in 1-2 pages **one** of the following: ***(10 marks)***

   i. Explain why wood is "tough" across the grain, but rather "brittle" along the grain, describing the various mechanisms that account for the toughness across the grain
   ii. Describe in detail how the structural organisation of the microfibrils in the cell wall and the chemical composition of the cell wall affects the fibre properties. Using reaction wood as examples, describe how the chemistry and structure of the cell wall can adapt to the local loading conditions

5. Write an essay (1-3 pages) on **one** of the following topics: ***(10 marks)***

   i. Sorption in wood
   ii. Differences between the anatomies of hardwoods and softwoods
   iii. Factors affecting the strength of wood
   iv. The viscoelastic behaviour of wood