Aalto University School of Science and Technology **EXAMINATION**
Faculty of Chemistry and Material Sciences
Department of Forest Products Technology
Chemical Pulping and Wood Refinery
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Puu-23.2000 Principles of Pulping Processes

Note! Please indicate on the top of your exam paper if you have attended the course's practical laboratory work. When?

1. Look at the statements below dealing with pulping technology (a-e). Are they true or false? Correct the false statements.
   a. Eucalyptus wood, due to its long and strong fibres, is a good raw material for pulping. (1 p)
   b. Most of the liquid transport in hardwood trees takes place in the tracheids. (1 p)
   c. The sulfite process is the most important industrial pulping method. (1 p)
   d. Bagasse is produced from hemp. (1 p)
   e. Globally, the annual forest growth slightly exceeds the wood consumption, i.e. the world's wood reserves are increasing. (1 p)

2. If a kraft pulp mill increases the amount of water used in the brown stock washing, how are, in your opinion, following properties of the pulp or the specific process steps affected? Justify your answers!
   a. Operating costs of the evaporation plant
   b. Kappa number after the oxygen stage
   c. Washing loss
   d. Chemical consumption in bleaching
   e. COD content of the effluents
   (a-e: correct and justified answer gives 1 p)

3. A kraft pulp mill uses a bleaching sequence AD_0 EOP D_1 D_2.
   a. Explain which bleaching stages and chemicals are used in the sequence. In addition, describe the objectives and conditions of each bleaching stage. (4 p)
   b. Which is a more probable product of the mill: softwood or hardwood pulp? Justify your answer! (0.5 p)
   c. Is the mill using a TCF or ECF sequence? Justify! (0.5 p)

4. Pulp washing:
   a) Explain dilution factor, washing loss and E-value (3p)
   b) Washing of pulp is based on dilution, thickening and displacement. Estimate their effect in washing with following equipment (2p):
      - Drum washer
      - Diffuser
      - Press washer
      - DD washer

5. Explain shortly the following terms:
   - Z (0,5 p)
   - AOX (0,5 p)
   - Kappa reduction (1 p)
   - Pressure screen (1 p)
   - Pressure diffuser (1 p)
   - Burkeit (1 p)

6. a) Explain operational principle of multi-stage evaporation plant (2 p).
   b) Describe the process which makes kraft pulping self-sustaining in terms of energy (steam and electricity production) (3 p)

Grading:

12,5 - 15,5p => 1,
16- – 19 p => 2,
19+ – 22,5 p => 3,
23- – 26p => 4,
26+ - 30 p => 5.