

**BINDURA UNIVERSITY OF SCIENCE EDUCATION
CHEMISTRY DEPARTMENT**

COURSE: CH402: PULP AND PAPER TECHNOLOGY

BSc (Hons) CHEMICAL TECHNOLOGY: PART IV

2 HOURS

**ANSWER QUESTIONS ONE AND FOUR OTHERS. EACH QUESTION
CARRIES 20 MARKS**

.....

1. a) Explain the procedure for thermomechanical pulping. [7 marks]
- b) What is meant by the term sulphidity as applied to the Kraft process. [3 marks]
- c) Explain how paper produced from a refiner differs from that from a stone ground. [5 marks]
- d) State the properties of Kraft process effluents which could affect water quality parameters if discharged in water bodies. [5 marks]

SECTION A: ANSWER ANY TWO QUESTIONS

2. a) Discuss the important properties of cellulose that make it a suitable raw material for papermaking process and the properties of paper. [9 marks]
- b) What are the properties of hemicellulose that makes it an important component of papermaking? [3 marks]
- c) Extractives comprise of 3–8% by weight of dry wood. Explain the problems that can be presented by extractives of wood in paper making process. [5 marks]
- d) Explain why debarking is important. [3 marks]
3. a) Wood is the main raw material for pulp and paper industry. Write short notes to explain the following components of softwood.

- i) Springwood. [4 marks]
 - ii) Summerwood [4 marks]
 - iii) Heartwood [3 marks]
 - iv) Cambium [4 marks]
 - b) Discuss the ways that might be employed to decrease the overall impact of papermaking operations. [5 marks]
4. a) Comparison of properties of paper is based on the following properties. Briefly define each of them.
- (i) Canadian standard freeness (CSF)
 - (ii) Burst factor
 - (iii) Tear factor
 - (iv) Breaking length
 - (v) Brightness
 - (vi) Opacity [2×6 marks]
- b) Define the term chipping. [2 marks]
- c) Explain the advantages of using wood chips over logs in mill a complex. [6 marks]

SECTION B: ANSWER ANY TWO QUESTIONS FROM THIS SECTION.

5. a) Discuss the problems encountered when using hardwood in pulp and paper industry. [7 marks]
- b) Explain why fines from chipping process should be treated with conditions different from those of regular chips. [2 marks]
- c) Give the factors that affect chip consistency and quality from the chipping process. [4 marks]

- d) Discuss the factors which contribute to the greater strength of Kraft pulps . [5 marks]
 - e) Give at least two important by products of the Kraft process. [2 marks]
- 6.
- a) Explain what happens during the following stages of bleaching chemical pulps.
 - i) Chlorination [5 marks]
 - ii) Caustic extraction [5 marks]
 - b) Explain how bleachability of chemical pulps is determined. [4 marks]
 - c) Explain how the whiteness and strength of the low-cost papers made from mechanical pulps may be improved. [2 marks]
 - d) Explain why mechanical pulps are nearly always converted to the finished product at the pulping site. [4 marks]
7. Discuss the different papermaking unit operations, highlighting their functions. [20 marks]

END OF PAPER