higher education & training

Department:
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REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

PAPERMAKING N4

(11022114)

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
PAPERMAKING N4
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Write neatly and legibly.

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QUESTION 1: FIBRES, SECONDARY FIBRES AND STOCK PREPARATION

1.1 List THREE characteristics that make cellulose fibres suitable for the manufacturing of paper. (3)

1.2 Which type of pulp would one use to produce the following?

1.2.1 Newsprint

1.2.2 Tissue

(2 × 1) (2)

1.3 1.3.1 Make a labelled sketch of a pressure screen, showing its internal components.

1.3.2 Describe the operating parameters of pressure screens.

(2 × 3) (6)

1.4 Dispersion is a technique used in the de-inking process to remove small ink particles.

Explain how this is accomplished. (3)

1.5 With the aid of a diagram, explain how wet broke is processed on a typical high-speed newsprint machine. (6)

[20]

QUESTION 2: HEADBOX AND DRAINAGE

2.1 2.1.1 Make a labelled sketch of a typical thick-stock addition and dilution system in the approach flow system of a paper machine. (4)

2.1.2 Discuss the design and operation of the approach flow system. (5)

2.2 Explain how head box level and total head can be controlled in air-cushioned head boxes. (4)

2.3 Explain which adjustments one would make to correct variations in the cross-machine basis mass profile. (5)

2.4 The various factors involved in sheet formation in air-padded head boxes are jet-to-wire ratio, jet angle, L/b ratio and forming-board position.

Describe how each factor affects formation and other properties. (10)

[28]

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QUESTION 3: WET-END ADDITIVES

3.1 Explain the meaning of *retention* and why it is important to the papermaker. (2)

3.2 3.2.1 Name ONE problem caused by slime on a paper machine. (1)

3.2.2 Propose a strategy to control slime on a paper machine (3)

3.3 3.3.1 What are the benefits of ASA sizing?

3.3.2 Describe the role of cationic starch in an ASA emulsification system.

(2 × 2) (4)
[10]

QUESTION 4: PRESSING AND DRYING

4.1 Significant savings in energy costs can be made if dryness of the sheet leaving the press section is increased.

Discuss in detail how one can increase water removal from the sheet in the press section. (8)

4.2 Explain the operating principles of the thermocompressor steam and condensate system. Use a labelled DIAGRAM to aid your explanation. (9)
[17]

QUESTION 5: SURFACE TREATMENT, COATING, WINDING AND FINISHING

5.1 The various factors affecting the quantity of starch picked up at the size press can be divided into two groups, namely, absorption factors and film-splitting factors.

Name these factors and explain how each factor affects starch pickup. (4)

5.2 Explain what is meant by the term *edge relief* on the calendar stack. (2)

5.3 Explain how *roll density profile* can be controlled on the winder. (5)
[11]

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QUESTION 6: PAPER PROPERTIES AND PHYSICS

The appearance or optical properties of paper are of considerable importance to the user.

Define the following terms and explain what factors influence each property:

6.1 Opacity

6.2 Brightness

6.3 Gloss

(3 × 2) **[6]**

QUESTION 7: MACHINE CLOTHING, DOCTORS, SHOWERS AND ROLLS

The press section can only function effectively if its felts are clean and porous. It is imperative that this important aspect should not be neglected during daily papermaking operations.

Discuss felt-cleaning and conditioning under the following headings:

7.1 Economic considerations (3)

7.2 Mechanical cleaning (2)

7.3 Chemical cleaning (3)

[8]

TOTAL: 100

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