higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T1260**(E)**(A2)T

NATIONAL CERTIFICATE

PAPERMAKING N4

(11022114)

2 August 2018 (X-Paper)
09:00–12:00

This question paper consists of 6 pages.

Copyright reserved

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.

Copyright reserved

QUESTION 1: FIBRES, SECONDARY FIBRES AND STOCK PREPARATION

1.1 Make a labelled process flow diagram of a recycled fibre plant which uses flotation cells in its processes. (6)

1.2 Explain the principle of operation of flotation cells. (3)

1.3 Discuss the design parameters of centrifugal cleaners. (4)

1.4 The refining of pulp at high consistency can be beneficial to the properties of pulp and paper.

What are the benefits of high-consistency refining? (2)

1.5 Explain the operations of a disk save with the aid of a drawing. (6)
[21]

QUESTION 2: WET END, HEADBOX AND DRAINAGE

2.1 The main function of the approach flow system is to dilute the thick stock.

2.1.1 Why is it necessary to dilute the thick stock? (1)

2.1.2 Explain how dilution is achieved and controlled in an approach flow system. (4)

2.2 2.2.1 Make a labelled drawing of the fourdrinier section of a paper machine. (5)

2.2.2 State the function of each component of the drawing in QUESTION 2.2.1. (5)

2.3 The drainage profile at the wet end has a major influence on sheet formation.

2.3.1 State the requirements for a good drainage profile on the fourdrinier section of a paper machine. (5)

2.3.2 Draw and label a graph which shows a drainage profile that is considered to be acceptable for the production of good quality paper. (3)
[23]

Copyright reserved

QUESTION 3: WET END ADDITIVES

3.1 What are the benefits of a good retention aid programme? (2)

3.2 Explain the term *zeta potential* and why it is important to the papermaking process. (3)

3.3 Proper application of HMW polymers is critical to their success as retention aids.

Explain the principles of application for HMW polymers. (4)

3.4 Explain how you can reduce problems caused by slime. (2)
[11]

QUESTION 4: PRESSING AND DRYING

4.1 The pressing action can be divided into two distinct types, namely pressure-controlled action and flow-controlled action.

Discuss these TWO types of pressing action. (4)

4.2 Explain how the following factors affect water removal in the press section:

4.2.1 Press loading

4.2.2 Sheet temperature

4.2.3 Machine speed

(3 × 1) (3)

4.3 Explain the operation of a three-stage cascade steam and condensate system with the aid of a labelled diagram. (9)
[16]

Copyright reserved

QUESTION 5: SURFACE TREATMENT, COATING, WINDING AND FINISHING

5.1 A poorly operated size press installation can significantly reduce the operational efficiency of a paper machine as a result of an increase in lost time and broke losses.

Describe the controls that are necessary for good size press operation. (4)

5.2 5.2.1 Explain the term *calendar barring.* (1)

5.2.2 How can this problem be reduced? (2)

5.3 5.3.1 Draw a labelled graph showing the ideal roll density profile. (3)

5.3.2 Explain how the density profile can be controlled on the winder. (5)
[15]

QUESTION 6: PAPER PROPERTIES AND PHYSICS

Quality tests are done on finished products in order to ensure that the product meets customer requirements.

What does each of the following tests tell us about the product?

6.1 Mullen

6.2 Ring crush

6.3 Internal bond

6.4 Scuff resistance

6.5 Cobb value

(5 × 1) **[5]**

Copyright reserved

QUESTION 7: MACHINE CLOTHING, DOCTORS, SHOWERS AND ROLLS

7.1 The press felt is designed to perform specific functions, some of which are to absorb water expressed from the sheet, to impart a desirable surface finish to the sheet and to act as a power transmission belt.

Describe FOUR properties of the felt which enable it to perform these functions. (4)

7.2 Discuss felt cleaning and conditioning under the following headings:

7.2.1 Mechanical cleaning (3)

7.2.2 Chemical cleaning (2)
[9]

TOTAL: 100

Copyright reserved