NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF INDUSTRIAL TECHNOLOGY
DEPARTMENT OF TEXTILE TECHNOLOGY
FIRST SEMESTER EXAMINATIONS DECEMBER 2004
YARN TECHNOLOGY TXT 2107

Instructions to Candidates
Answer all questions in Section A and any THREE in Section B.   Total marks = 100

Section A

1   Calculate the twist level given that the twist multiplier is 40 TM and the yarn
count is 50tex.   (2 marks)

2.   What is the demand placed on good rings and travellers.   (6 marks)

3.   List three main types of travellers and outline their properties.   (4 marks)

4.   Calculate the Amplitude of periodic variation produced by an eccentric top roller
with ecentricity of 0.04cm, and a draft of 12, the diameter of top and bottom
rollers being 3.2cm.   (4 marks)

5(a)   What measures are employed to ensure a shorter roller drafting process (high
drafts).   (3 marks)

(b)   What are the benefits achieved by employing such measures.   (2 marks)

6.   Give three new developments in ring spinning, which are production related and
briefly describe the methods of operation.   (6 marks)

7(a)   What is the main function of drawframe doubling.   (2 marks)

(b)   Calculate the number of doublings required to achieve acceptable randomness for
a 25 tex yarn, if the average fineness of fibres is 1.3 dtex, using a drawframe with
6 slivers how many passages will the sliver receive.   (5 marks)

8.   Calculate the production in kg/hr of a 2 head drawframe with a delivery rate of
390m/min of 5.5 ktex sliver and an efficiency of 96%. Given that the drawframe
production should be 5% higher than the ringframe production, how many
ringframe spindles will this machine supply when its delivery rate is 14.6m/min
and producing 30 tex yarn.   (6 marks)

SECTION B (Answer any three)

1(a)   Calculate the production of a ringframe in kg/hr using the following information.
-          spindle speed 166.7 revs/sec

-          linear density of yarn 25 tex
-          twist in yarn 800 turns/m
-          number of spindles 620
-          machine efficiency 97%   (8 marks)

(b)   Discuss factors affecting twist insertion in dref spinning and show a relationship
for twist inserted and the following

-          delivery speed
-          diameter of spinning drums
-          diameter of yarn
-          coefficient of friction between fibres and drums
-          etc

Justify this relationship from the factors mentioned above.   (12 marks)

2(a)   From the following information on a rotor machine, calculate

-          load of the withdrawal point   (3 marks)
-          turns/m   (2 marks)
-          back doubling   (3 marks)

Given that the rotor diameter is 40 mm, rotor speed is 10 000 revs/min and delivery speed
is 15m/min

2(b)   Calculate the corrected traveller speed from the following information,
spindle speed 9000 rpm, ring diameter 60 mm, front roller delivery speed
15m/min, package diameter 105mm and take up factor k = 0.98.   (8 marks)

(c)   To maintain the same traveller speed, what would be the spindle speed if the
ring diameter is reduced to 40 mm.   (4 marks)

3(a)   (i)   With the help of a clear diagram explain the operation of an auto-weighing
device of a card. What is the condition that should be met to ensure
proper evening of the blend on the spiked lattice   (4 marks)

        (ii)   Given the working stroke of the evening comb is equal to 0.12 calculate
the minimum velocity of the spiked lattice.   (4 marks)

(b)   A drawframe is fed with 8 cotton slivers of 15ktex, accordingly the sum of all the CV% values of the single slivers is 22.4%. The irregularity of the output slivers from the drawframe is 3.9%

-       Calculate the CV% introduced by the drafting arrangement.   (4 marks)

     (i)   Describe a perfect draft and outline how a perfect draft differs from real draft.   (5 marks)

     (ii)   Describe how drafting waves are formed   (3 marks)

4 (a)   Describe factors causing spinning product irregularities during roller drafting. Outline clearly how different conditions affect the wavelengths and amplitudes of yarn irregularities.   (15 marks)

(b)   Given that the interaction of an eccentric boss inside position is 1.9, what is the maximum permissible eccentricity given that the maximum permissible amplitude of on eccentric top roller is 9%, that the top roller and bottom roller diameter is 2.5 cm and highest draft is 12.   (5 marks)

(5)   With the help of a clear diagram, show that yarn tension between the traveller and bobbin is given by

$$P = \frac{\mu m w^2 R^2}{r}$$

P   =   yarn tension
μ   =   friction between the traveller and ring
m   =   mass of the traveller
w   =   angular velocity of the traveller in radians
R   =   ring radius
r   =   radius of the package

What practical conclusions can be drawn from this relationship?   (20 marks)

END OF QUESTION PAPER