NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

Faculty of Industrial Technology

Department of Technical Teacher Education

Manufacturing Technology -TBE1246

September 2010 Examination

Instructions

1. Examination length is **3hrs**.

2. Each question carries twenty (**25**) marks and there are five (**5**) questions in total.

3. Attempt any four questions.

Question 1

Non-ferrous water taps are sand cast. Describe using illustrations where necessary the steps that are followed in the mass production of these components. **[25]**

Question 2

a)   Explain the role of the surface area of a casting during solidification. **[5]**

b)   With the aid of Chvorinov's rule calculate the relative solidification times for castings of unity volume and of the following shapes, cast in ceramic moulds:

  i.   Sphere of diameter d **[3]**

  ii.   Cylinder with $h/d =1$ **[3]**

 iii.   Cylinder with $h/d =10$ **[3]**

 iv.   Cube of width $2d$ **[3]**

c)   Plot the results in 2b on graph paper to illustrate the effect of shape changes. Comment on the graph obtained. **[8]**

Question 3

a)   Discuss the forms of shrinkage that occur during casting and how, if possible, they can be countered. **[10]**

b)   The nature of the casting operation presents numerous opportunities for defects to appear in the product. Give and explain any five defect categories.   **[15]**

Question 4

a)   State the furnace types commonly found in foundries.   **[4]**

b)   Discuss the considerations in choosing a furnace.   **[12]**

c)   Describe plaster moulding.   **[9]**

Question 5

A steel plate casting 5 cm x 7 cm x 35 cm is poured in 20 seconds, the effective sprue height is 15 cm, and the gating ratio is 1:3:1.5. The density of steel is 7.86 g/cm^3 and the casting yield is 74%. The cylindrical tapered sprue is connected to two square runners, and each runner is connected to two gates that have a width two times the height. The dynamic viscosity of steel is 0.06 g/cm.sec. Determine the following:

a)   The amount of metal poured (g and cm^3).   **[4]**

b)   The pouring rate (g/s and cm^3/s).   **[3]**

c)   The choke velocity (cm/s).   **[2]**

d)   The choke area and the location of the choke.   **[4]**

e)   The dimensions of the sprue base, each runner, and each gate (cm).   **[8]**

f)   The Reynolds number for melt flow in the runners. Comment on the nature of melt flow in the runners.   **[4]**

End of exam

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF TECHNICAL TEACHER EDUCATION
SUPPLEMENTARY EXAMINATIONS: 2010
TBE 1290 – PREPERATION
TIME: 3 HOURS

INSTRUCTIONS

Instructions to candidates

Answer ALL questions.

QUESTION 1

    (a) Explain why acid dyes are classified as anionic and why they combine directly with animal fibres but not with vegetable fibres.   **4marks**
    (b) Discuss the application classification of acid dyes. Comment on the relative fastness properties of these classes.   **12marks**
    (c) Most direct dyes have limited wet fastness in medium to full shades unless they are after-treaded. List four (4) methods of improving fastness properties of direct dyes.   **4 marks**

QUESTION 2
(a) State and explain the main stages in the dyeing of cellulosic fabrics with vat dyes. Comment on the fastness properties of this class of dyes.   **6marks**
(b) Suggest with reasons the end use application of sulphur dyes.   **4marks**
 (c) What is the role of desizing on cotton fabrics? How is desizing carried out on cotton?   **4marks**
 (d) Explain the aims and objectives of fabric preparation.   **6marks**

QUESTION 3

(a) With aid of illustrations/diagrams explain why reactive dyes have wet fastness properties.   **4marks**
 (b) When dyeing with reactive dyes, fast addition of alkali may cause fast strike. Explain why. What problem/s can this cause?   **2 marks**
(c) Why do reactive dyes have a relatively large number of sulphonic acid groups?
    2marks
    (d) Outline the fastness properties of reactive indicating what end uses would products dyed with these dyes be used for.   **6marks**
(e) Why is it essential to use retarders when dyeing acrylics with basic dyes? Give examples of one common retarder.   **3marks**

(f) Given the following: Weight of fabric to dyed 1000kg
Liquor ratio 10:1
Salt 50g/l
Depth of shade of blue direct dye 2% owf
Calculate
i.   amount dye required
ii.   amount of salt
iii.   amount of liquor

3marks

QUESTION 4

(a) Define printing? 2marks
(b) What do you understand by the following terms used in printing:
   i.   Batik
   ii.   Design repeat
   iii.   Squeegee
   iv.   Binder
   v.   Water retaining agent
   vi.   Cross-linking agent   **6marks**

 (c) Explain the printing procedure adopted when printing with pigments.6marks
 (d) Give reasons why pigment accounts for more than fifty percent of all printing
worldwide.   **6marks**

QUESTION 6

 (a) Discuss the procedures for printing of cellulosics using reactive dyes. **10marks**

 (b) Compare and contrast the flat bed printing machine and rotary screen printing
   machine.   **10marks**

END OF EXAMINATION PAPER