KIMATHI UNIVERSITY COLLEGE OF TECHNOLOGY

University Examinations 2012/2013

THIRD YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN MECHATRONIC ENGINEERING

EMT 2305: PRODUCTION TECHNOLOGY I

DATE: AUGUST 2012 **TIME: 2 HOURS**

INSTRUCTIONS

i. This paper contains **FIVE (5)** questions.

ii. You are required to answer **THREE (3)** questions only.

iii. Question **ONE** is compulsory.

iv. Attempt ONE question from SECTION A and ONE question from SECTION B.

QUESTION ONE (COMPULSORY) (30 MARKS)

(a) Describe the following terms as used in forming:

i. Strain hardening

ii. Recrystallization temperature [2 marks]

(b) Outline three differences between cold working and hot working of metals. [3 marks]

(c) Describe two characteristics of metals that affect forming. [3 marks]

(d) With the aid of a diagram, describe the following terms as used in bending:

i. Neutral axis

ii. Bend allowance

iii. Minimum bend radius [4 marks]

(e) Describe the following drawing operations:

i. Ironing

ii. Deep drawing

Use the appropriate sketches. [3 marks]

(f) List four advantages of hydroforming. [2 marks]

(g) Describe the following terms as used in casting:

i. Cope

ii. Riser

iii. Parting line [3 marks]

(h) List four methods of reducing porosity caused by shrinkage during casting. [2 marks]

(i) i. Explain the purpose of additives in polymers. [1 mark]

ii. Describe the purpose of plasticizers. [1 mark]

(j) Describe three general properties of polymers. [3 marks]

(k) Describe three general characteristics of glass–ceramics. [3 marks]

SECTION A

QUESTION TWO (20 MARKS)

(a) Describe two processing parameters in shearing. [3 marks]

(b) A hole of radius 25mm is to be punched through a 4mm thick aluminium sheet. Calculate the force required, given the ultimate tensile stress of aluminium as 450Pa. [2 marks]

(c) Describe the following shearing operations, with the aid of diagrams:

i. Piercing

ii. Lancing [3 marks]

(d) Describe the method of operation of progressive shearing dies. [2 marks]

(e) Describe two factors which affect edge cracking during bending. [3 marks]

(f) Differentiate between the following terms, with the aid of appropriate sketches:

i. Air bending and Wiper bending

ii. Draw bending and compression bending. [6 marks]

(g) Briefly describe the following allowances made in casting:

(a) Shrinkage allowance

(b) Draft allowance [1 mark]

QUESTION THREE (20 MARKS)

(a) Describe two methods of straightening metal sheets. [3 marks]

(b) Describe the basic steps which are important in casting. [8 marks]

(c) Describe three properties of well prepared moulding sand. [3 marks]

(d) Describe the following methods of making sand molds:

i. Jolting

ii. Match–plate molding [3 marks]

(e) Differentiate between centrifuging and true centrifugal casting. Use the appropriate sketches. [3 marks]

SECTION B

QUESTION FOUR (20 MARKS)

(a) Define polymerization. [1 mark]

(b) Differentiate between the following polymer types:

i. Thermoplastic and thermosetting polymers

ii. Branched and network polymers. [4 marks]

(c) Describe the following methods of fabrication of plastics, with the aid of sketches:

i. Blow molding

ii. Transfer Molding

iii. Rotational Moulding [6 marks]

(d) Describe two methods of preventing deterioration of the polymer due to exposure to UV light. [3 marks]

(e) Describe the effect of elastic deformation on elastomers, with the aid of sketches. [2 marks]

(f) Differentiate between injection molding and extrusion of polymers. [4 marks]

QUESTION FIVE (20 MARKS)

(a) List three important properties of refractories. [3 marks]

(b) Describe four different forming methods used in the fabrication of glasses. [8 marks]

(c) Describe two methods used in the fabrication of crystalline ceramics. [5 marks]

(d) Describe four important points of temperaures with respect to glasses. [4 marks]