



**UNIVERSITI KUALA LUMPUR**  
**Malaysia France Institute**

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**FINAL EXAMINATION**  
**JULY 2010 SESSION**

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**SUBJECT CODE** : FGB 32103  
**SUBJECT TITLE** : MANUFACTURING SCIENCE  
**LEVEL** : BACHELOR  
**TIME / DURATION** : 9.00am – 11.30am  
( 2.5 HOURS )  
**DATE** : 14 NOVEMBER 2010

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**INSTRUCTIONS TO CANDIDATES**

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1. Please read the instructions given in the question paper CAREFULLY.
  2. This question paper is printed on both sides of the paper.
  3. Please write your answers on the answer booklet provided.
  4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
  5. This paper consists of TWO (2) sections. Section A and B. Answer ALL questions in section A. For section B answer THREE (3) questions only.
  6. Answer all questions in English.
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THERE ARE 6 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

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**SECTION A (Total: 40 marks)****INSTRUCTION: Answer all questions.****Please use the answer booklet provided.****Question 1**

- (a) Explain any five (5) of general shape attribute in shape-generating capabilities for processing characteristic.  
(5 Marks)
- (b) Give the reasons for decision making on materials and processing in manufacturing.  
(5 Marks)

**Question 2**

- (a) What is the purpose of too angle such as side rake angle and side relief angle?  
(5 Marks)
- (b) How do you differentiate between abrasive wear and diffusion wear of a cutting tool during machining? Explain clearly one (1) of the wear mechanism and how it can be controlled.  
(5 Marks)

**Question 3**

- (a) Sketch and explain compound die for blanking process.  
(5 Marks)
- (b) Explain the hydraulic press with neat sketch  
(5 Marks)

**Question 4**

(a) Briefly explain two (2) possible actions to prevent the vacuum generation.

(5 Marks)

(b) Explain two (2) methods that can be used to prevent the formation a shrinkage cavity in the sand casting.

(5 Marks)

**SECTION B (Total: 60 marks)**

**INSTRUCTION: Answer any three (3) questions only.**

**Please use the answer booklet provided.**

**Question 1**

Develop systematic procedure for selection for selection primary process and material combination. The part is shown in Figure 1.1, which is to be used and oven bracket.

(20 Marks)

A. Shape producing capabilities:

- |                             |     |
|-----------------------------|-----|
| (i) Depressions             | Yes |
| (ii) Uniform Wall           | Yes |
| (iii) Uniform cross section | Yes |
| (iv) Axis of rotation       | No  |
| (v) Regular cross section   | No  |
| (vi) Captured cavity        | No  |
| (vii) Enclosed cavity       | No  |
| (viii) No draft             | Yes |

B. Material requirement

- (i) Maximum temperature of 500<sup>o</sup> C
- (ii) Excellent corrosion resistance to weak acids and alkalis

## C. Process capable

- (i) Solidification process; sand casting, die casting and injection casting.
- (ii) Bulk deformation; close die forging, powder metal, hot extrusion.
- (iii) Material removal process; Machining and EDM.
- (iv) Sheet forming; sheet metal (stamping and bending).

## D. Materials

- (i) Cast iron
- (ii) Carbon steel
- (iii) Aluminium and alloys
- (iv) Zinc and alloys
- (v) Magnesium and alloys
- (vi) Titanium and alloys
- (vii) Thermoplastics

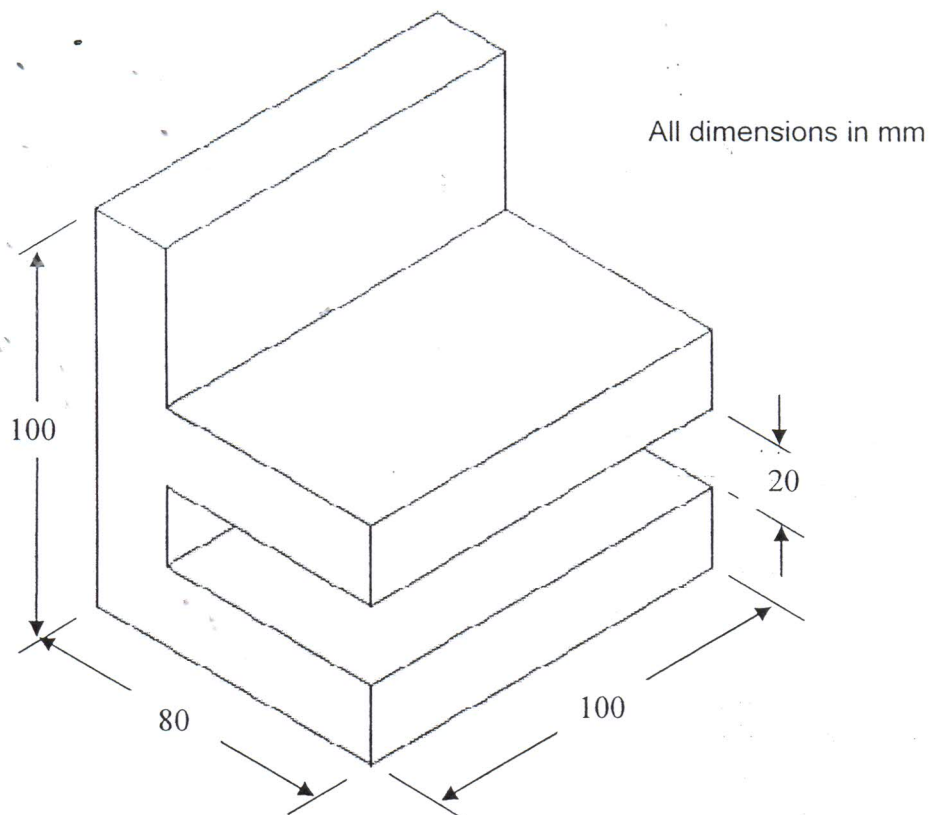


Figure 1.1 Oven bracket

**Question 2**

In orthogonal cutting test with a tool of rake angle  $10^\circ$ , the following observations were made:

Chip thickness ratio = 0.3

Horizontal component of cutting force = 1290 N

Vertical component of the cutting force = 1650 N

From Merchant's theory, calculate:

- (i) The various components of the cutting forces

(15 Marks)

- (ii) The coefficient of friction at the chip tool interface

(5 Marks)

**Question 3**

- (a) Determine the die and punch sizes for blanking a circular disc of 20 mm diameter from steel having  $294 \text{ kg/mm}^2$  shear strength and thickness of the sheet is 1.5 mm.

(10 marks)

- (a) A 25 mm square hole is to be cut in sheet metal 0.75 mm thick. The shear strength of the metal is  $2860 \text{ kg/cm}^2$ . Calculate the cutting force.

(10 Marks)



**Question 4**

A time to fill bottom gated mold as shown in Figure 4.1 overleaf can be determined using below equation;

$$t_f = \frac{2C}{A\sqrt{2g}} [\sqrt{h} - \sqrt{(h-H_m)}]$$

Where;

$t_f$  = time to fill the mold cavity

$C$  = area of mold base

$A$  = choke area

$g$  = acceleration due to gravity

$h$  = head of metal above choke

$H_m$  = height of mold cavity

Determine the mold filling time,  $t_f$  for the casting shown in figure 4.1

- (i) produce by bottom gating position shown in Figure 4.1 (a)

(10 Marks)

- (ii) produce by top gating position shown in Figure 4.1 (b)

(10 Marks)

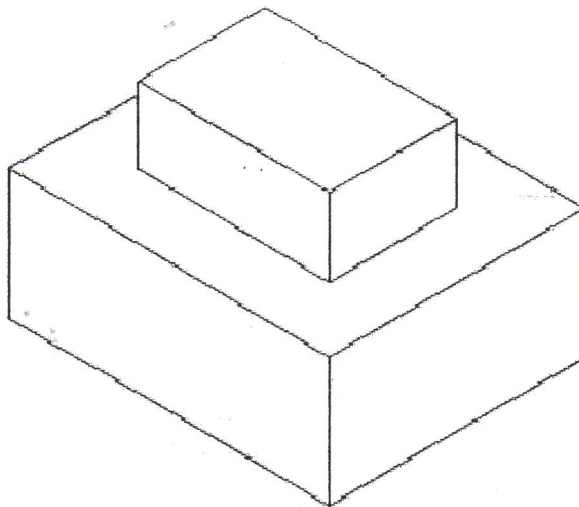


Figure 4.1

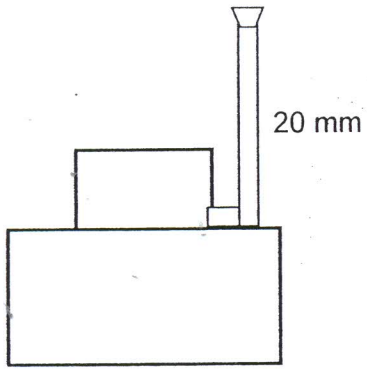


Figure 4.1(a)

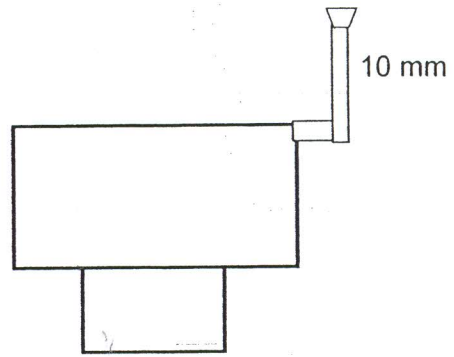


Figure 4.1(b)

END OF QUESTION