



**UNIVERSITI KUALA LUMPUR
Malaysia France Institute**

**FINAL EXAMINATION
JANUARY 2011 SESSION**

SUBJECT CODE : FFD 12201
SUBJECT TITLE : METAL FABRICATION PROCESSES
LEVEL : DIPLOMA
TIME / DURATION : 3.30pm – 5.30pm
(2 HOURS)
DATE : 07 MAY 2011

INSTRUCTIONS TO CANDIDATES

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 question paper consists of **TWO (2)** sections. Section A and B. Answer all questions in Section A. For Section B, answer **ONE (1)** question only.
 6. Answer all questions in English.
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THERE ARE 9 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

Question 1

- (a) There are several types of properties of the metals. State five (5) properties of metals and explain their definitions briefly. (10 marks)
- (b) According to Figure 1 (Hot-Rolling Steel), explain briefly the effects of hot rolling operation.

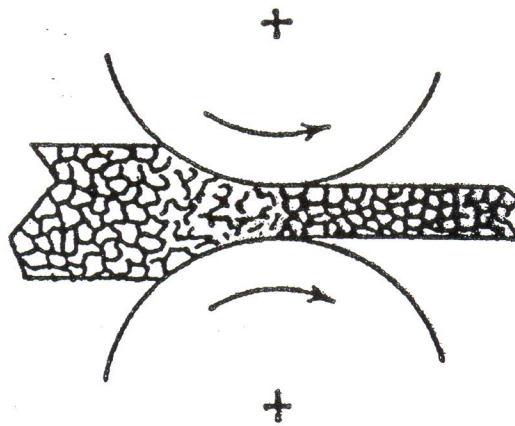


Figure 1: Hot-Rolling Steel

(5 marks)

- (c) The Figure 2 is the second stage of making iron to steel ingots. Iron will be melted by the furnaces before it becomes steel ingots. Fill in the blanks of Figure 2(Production of steel) the types of furnaces on page 2.

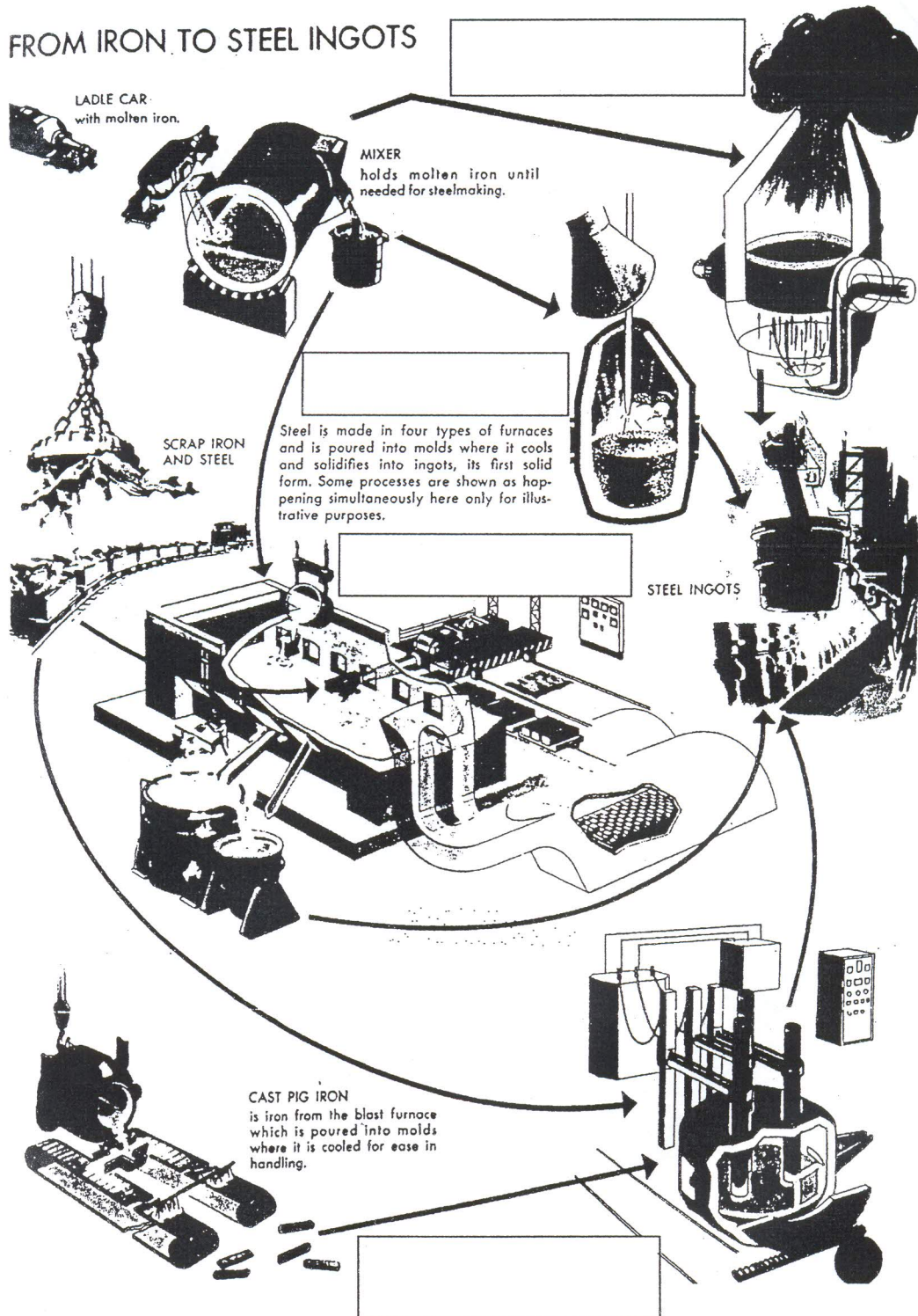


Figure 2: Production of Steel

(6 marks)

Question 2

- (a) Illustrate and explain briefly the methods of operation in workholding for riveting. (9 marks)
- (b) In figure 3, name and sketch the type of devices that are commonly used for joining the **Joint A** and obtaining correct round for the **Circumference 1**.

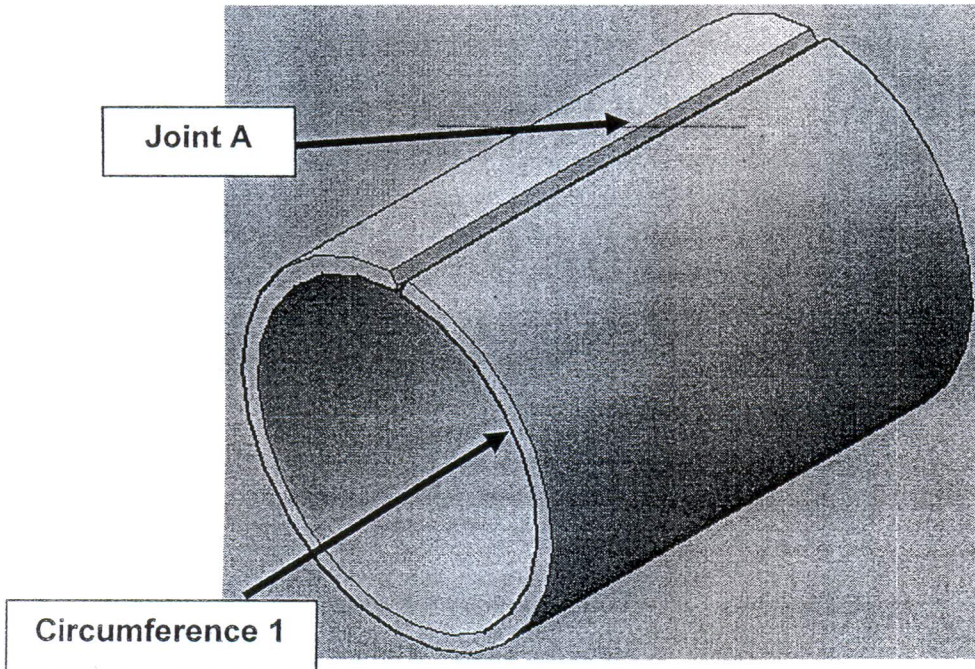


Figure 3: Cylinder

(6 marks)

- (c) One of the devices that uses in Figure 4 is the Magnetic Clamps; sketch and explain its usage briefly.

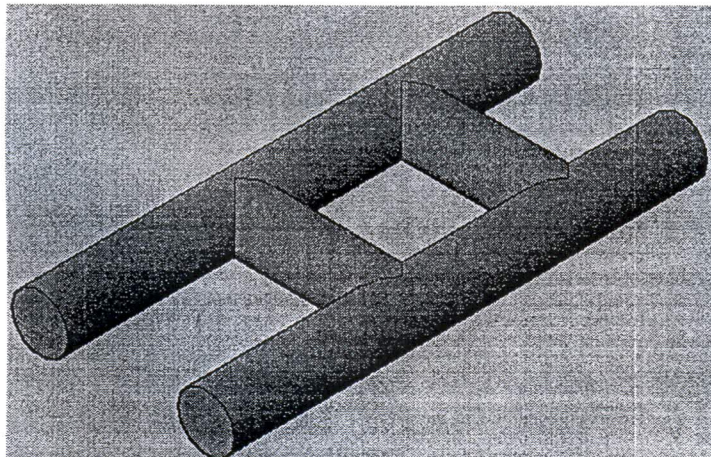


Figure 4: Tube Structure

(4 marks)

Question 3

- (a) Illustrate and explain briefly the basic principle of stiffening. (5 marks)
- (b) State the methods of imparting stiffness to sheet metal. (3 marks)
- (c) According to Figure 5(drum), identify and explain briefly the type of stiffener that is applied on the body of the drum.

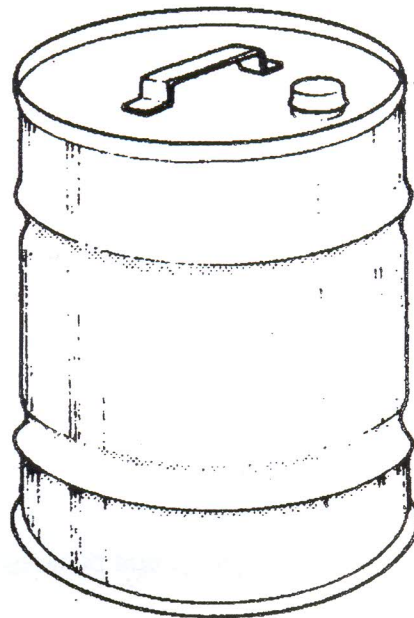


Figure 5: Drum

- (d) Sketch the Single Hem and Double Hem and explain briefly the greatest impact between both of them and their applications. (5 marks)
- (7 marks)

SECTION B (Total: 40 marks)

INSTRUCTION: Answer ONE (1) question only.
Please use the answer booklet provided.

Question 1

(a) i. Explain briefly the following cutting processes. and distinguish the Blanking and Punching processes by sketching methods.

1. Punching
2. Blanking
3. Notching

(6 marks)

ii. Distinguish the Blanking and Punching processes by sketching methods.

(2 marks)

(b) With reference to Figure 6, answer the questions below:

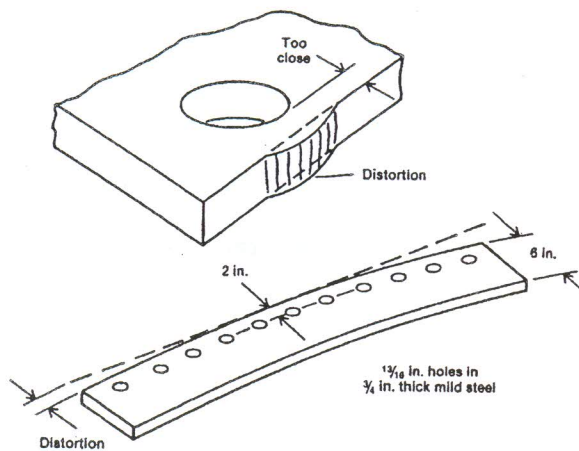


Figure 6: Distortion resulting from off-center punching

i. Explain briefly how to overcome bulging along the edge?

(4 marks)

ii. Give one suggestion to overcome cambering due to off-center punching

With reference

- (c) One of the latest concepts in the metal fabrication industry is the introduction of the Flexible Manufacturing System (FMS). This system incorporates a series of machines and work stations linked by a common control, providing an automatic production of a family of parts for continuous processing.

A fabrication of sheet metal or plate requires a variety of tools. So, the problem of having the right tool on the machine at the right time in a flexible fabricating system is complex, especially when one machine will be used to produce a wide variety of parts, each requiring several different tools.

In an automatic part nesting system, the analyzing daily fabrication requirements, (including manageable cost variables such as machines production rates, inventory control, labor costs, and scrap rates) produces parts when they are needed, in the quantities required. The system will lay out different parts in any multiples nested at random, based on schedule requirements rather than only on efficiency of material utilization.

With reference to the explanations in Question 1(c), answer the questions below:

- i. Why is the Flexible Manufacturing Systems designed?
(2 marks)
- ii. There are four (4) levels of flexible manufacturing system. State two (2) levels only.
(6 marks)
- iii. What is the first step in managing the tool requirements in an FMS?
(3 marks)
- iv. How does the automatic nesting system do when producing parts needed and quantity required?
(4 marks)

- (d) Many problems that exist in this area of sheet-metal and plate fabrication are also coming from the needs of the press owner. In designing punching tools, there are probably several features that need to take in account such as costs, changeability, applications etc. It is a management decision as to be used in any punching application. Areas to be considered should include the availability of tooling, both

standard and special. Then, the tooling-change time and the number of holes to be punched. Last but not least the cost of tooling.

With reference to the above explanations, answer the questions below:

- i. State the five (5) probably greatest features in designing tools for a press.
(5 marks)
- ii. Give four (4) areas that should be considered in making decisions when using any punching application.
(4 marks)

Question 2

Many pressworking operations are performed using the same 'shearing' principles. The shearing, punching, perforating, piercing, extruding, notching, blanking are included in the shearing principle.

The shear cutting or punching action results from a closing motion of two sharp, closely adjoined edges on materials placed between them. The material is stressed in shear to the point of fracture while going through three phases which are the deformation, the penetration and the fracture.

With reference to the explanations in Question 2(a), answer the questions below:

- (a) i. Define the following pressworking operations that use the same shearing principle and differentiate them by sketching method.
 1. Blanking
 2. Notching(6 marks)
- ii. Explain briefly and illustrate the following three fracture phases.
 1. Deformation
 2. Penetration
 3. Fracture(9 marks)
- iii. What is the safest thickness and diameter hole for punching of mild steel?
(4 marks)

- (b) The W. A. Whitney Flexible Manufacturing System (FMS) employs the latest cutting concepts which are the gas-laser cutting and air-plasma cutting. Each manufacturing application has a specific set of requirements which may be satisfied by either of these cutting technologies. The air-plasma cutting system cuts three to five times faster than conventional gas cutting methods. It is applicable on a wide variety of metals and alloys, such as stainless steel, chromium-nickel alloy steel, aluminum, copper, etc., which are not workable with conventional methods. The only limitation is that the material must be an electrical conductor. It is also can be workable on a wide range of material thicknesses. Best between 0.030 and 1.00 in. (0.8 and 25mm). The air-plasma is more efficient than other types of gas plasma.

To maximize the efficiencies of an FMS, automatic material loading is a vital aspect. Depending on the specific needs of the manufacturer, automatic storage and retrieval systems can be developed. Storage of raw material is provided in a number of configurations from single stacks of blanks on index pallets to elaborate libraries of pallets that are automatically moved to provide an uninterrupted flow of materials.

For an FMS to effectively produce random parts in random quantities, two factors are needed: automatic parts nesting, and automatic sorting and stacking. The automatic sorting is needed especially for small parts that are difficult to remove mechanically or pneumatically from the work station. Larger parts are removed from the plate by a programmable platen having a matrix of cushion cups or electromagnets. Parts are stacked on pallets and then automatically indexed to an unloading area for further processing.

With reference to the explanations in Question 2(b), answer the questions below:

- i. There are four (4) advantages of air-plasma cutting, state two (2) advantages only. (6 marks)
- ii. How to store raw materials in automatic material loading? (3 marks)
- iii. Why does the FMS need automatic sorting? (3 marks)

- (c) Punching of special-shape holes in sheet metal and plate can be done in many ways. Figure 7 shows that a typical hole for an electrical pushbutton. A special punch-and-die set could be manufactured for this application at a cost of approximately RM2500. However, this punching job can be done at a considerably lower tooling cost.

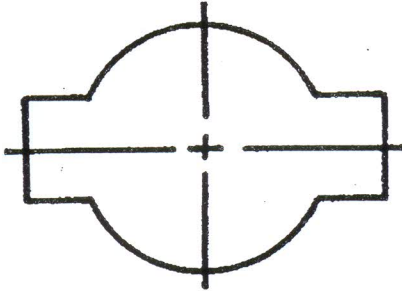


Figure 7: An Electrical pushbutton

Selecting of tooling can often 'make or break' the job. The use of tooling that is not intended for the application at hand is more often the rule than the exception. In conjunction with the problems that exist in this area of sheet-metal and plate fabrication, the needs of the press owner are also many. The greatest need probably is for a press with tooling design which incorporates several features such as low initial cost for tool holders. Next, the perishable tooling cost should be minimized. Tooling design also should be easy and quick to be changed. The accurate alignment on shaped punches and dies is a must, and it should be wide variety of tooling available for standard and special applications.

With reference to the explanations in Question 2(c), answer the questions below:

- i. Referring to Figure 7, Suggest briefly how to lower the tooling cost?
(4 marks)
- ii. Give the five (5) probably greatest need features in designing tool for a press.
(5 marks)

END OF QUESTION