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CONFIDENTIAL

SET B

# UNIVERSITI KUALA LUMPUR
## Malaysia France Institute

## FINAL EXAMINATION
## JANUARY 2011 SESSION

| | | |
|---|---|---|
| SUBJECT CODE | : | FFD 12402 |
| SUBJECT TITLE | : | FUNDAMENTAL OF METAL FABRICATION PROCESSES |
| LEVEL | : | DIPLOMA |
| TIME / DURATION | : | 12.30pm - 2.30pm ( 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.

THERE ARE 9 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

## SECTION A (Total: 60 marks)

**INSTRUCTION : Answer ALL question**

**Please use the answer booklet provided**

**Question 1**

**Put (T ) for TRUE and ( F ) for FALSE answer in each statement below.**

| | | T/F |
|---|---|---|
| i. | Light fabrication refers to product made of materials up to 3 mm. | |
| ii. | One of the fabricators task includes interprets engineering drawing. | |
| iii. | Blacksmiths use the forging process to make edge tools such as chisels and punches. | |
| iv. | Forming refers to sheet materials being rolled, folded or spun into shape. | |
| v. | Sheet, plate, bar, rod and wire are among the stock materials in the fabrication industry. | |
| vi. | Ferrous metals contain iron and are usually magnetic. | |
| vii. | Dividers are used for drawing arcs and circles, and marking out equal spaces. | |
| viii. | Files are made of high carbon steel. | |
| ix. | Thermal cutting refers to oxyacetylene cutting, plasma cutting and laser cutting | |
| x. | Non-ferrous metals cannot be cut using the above processes. | |
| xi. | Pyramid rolls are used for rolling plate steel and the machines are power operated. | |
| xii. | The shank is the portion of solid tapered core between the flutes. | |
| xiii. | Bronze, brass, copper and aluminium are said to be non-ferrous metals. | |
| xiv. | Angle bar is often call 'angle iron'. | |
| xv. | Cold chisels may be used to shear rivets. | |

(15 marks)

**Question 2**

(a) Name two (2) types of wheel dresser commonly used in dressing and truing abrasive

(4 marks)

(b) Name the two (2) types of portable or wheel grinders?

(4 marks)

(c) Graduated steel rules are used for measuring lengths, state the 3 marked available on a steel rules.

(6 marks)

(d) Name the 4 common cutting processes

(4 marks)

(e) Name 4 cutting processes which are similar to a shearing process.

(4 marks)

**Question 3**

(a) Explain briefly the methods of operation in work holding for riveting.

(8 marks)

(b) Many of squares used in the fabrication industries. Name the two (2) type of devices that commonly used for assemble the joint part.

(6 marks)

(c) What is the different between *light fabrication* and *heavy fabrication*. Explain briefly and give example for each one on your answer.

(4 marks)

(d) According to Figure 1 (drum), identify and explain briefly the type of stiffener that is applied on the body of the drum

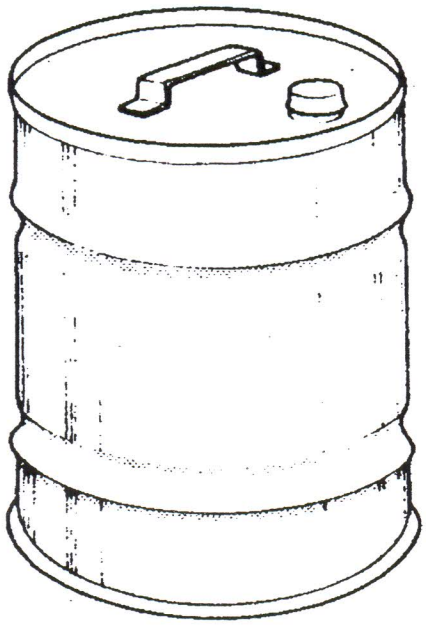

Figure 1: Drum

(5 marks)

**SECTION B (Total: 40 marks)**

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

**Question 1**

(a) You are given a cover bracket in Figure 2. State and explain briefly the most appropriate fabrication process that you would do to complete the fabricating task of the Cover Bracket.

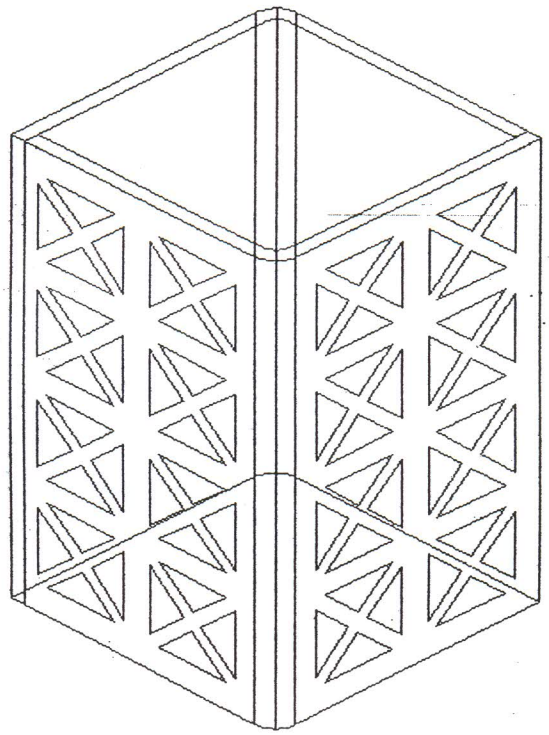

Figure 2: Cover Bracket

(8 marks)

(b) Punching can cause distortion. In some parts there is nothing that can be done to overcome it, but in many cases, steps can be taken to minimize it. One common problem is the closeness of a hole to the edge of a part, which if too close that causes bulging along the edge. Preferably, two times the thickness of the material should be allowed from the edge of the hole to the edge of the part.

Another frequent problem that occurs on strip and bar stock is camber due to off-center punching. Figure 3 (Distortion resulting from off-center punching) shows the type of distortion that will result. The holes should be on-center where possible, and the bar should not be too narrow. Insufficient clearance will cause increased outward forces produces.

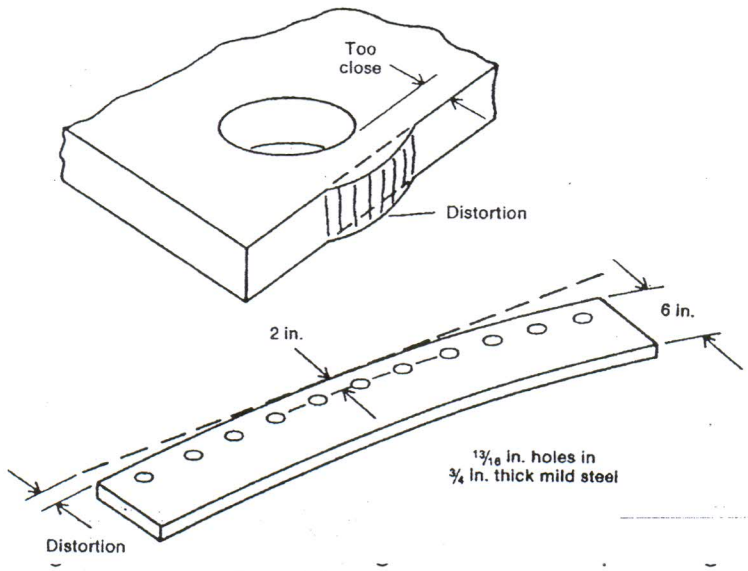


Figure 3 :Distortion resulting from off-center punching

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

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

(5 marks)

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

(5 marks)

(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.

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 (3) 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) The Give four (4) areas that should be considered in making decisions when using any punching application.

(4 marks)

(e) State the five (5) probably greatest features in designing tools for a press

(5 marks)

## Question 2

a) 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.

In the following Figure 4 (Ratio of material thickness to punch diameter as a function of shear strength), the curves are based on the punching strength values, and for a known shear strength (of the material being punched) the curves give the recommended thickness-to-diameter ratio. The curve shown as a dotted line represents the ultimate strength (300,000 psi); the solid curve, the recommended working stress (250,000 psi).

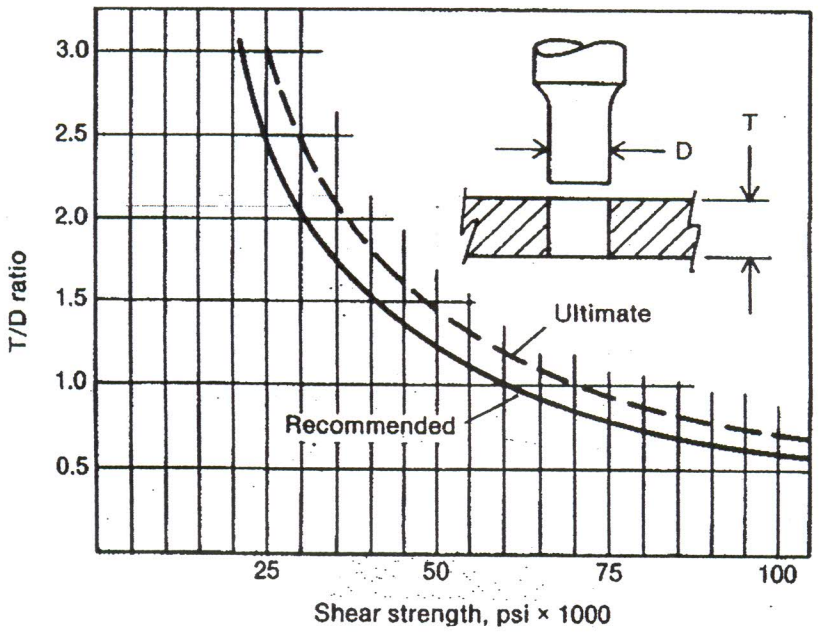


Figure 4: Ratio of material thickness to punch diameter as a function of shear strength

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

(a) i. Define the following press working operations that use the same shearing principle.

1. Perforating
2. Piercing
3. Extruding
4. Blanking
5. Notching

(10 marks)

ii. Explain briefly what does "deformation" mean?

(3 marks)

iii. What is the recommended thickness-to-diameter ratio for punching of mild steel with the shear strength of 50,000 psi?

(2 marks)

iv. What is the ultimate ratio for punching of mild steel with the shear strength of 50,000 psi ?

(2 marks)

v. What is the safest thickness and diameter hole for punching of mild steel?

(3 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) 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. Explain briefly how to lower the tooling cost?

(3 marks)

ii. Give the five (5) probably greatest need features in designing tool for a press.

(5 marks)

**END OF QUESTION**