Document No : UniKL MFI_SD_AC41
Revision No: 02
Effective Date: 01 December 2008

CONFIDENTIAL

SET B

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

JULY 2010 SESSION

SUBJECT CODE	:	FFD 12201
SUBJECT TITLE	:	METAL FABRICATION PROCESSES
LEVEL	:	DIPLOMA
TIME / DURATION	:	4.00 pm – 6.00 pm (2 HOURS)
DATE	:	15 NOVEMBER 2010

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 10 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

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

Question 1

Nearly all metals and their alloys can be formed in press. Which metal is chosen for a particular application depends on the requirements of part being made, the cost of manufacturing it, and the availability of metal.

Steel is composed primarily of iron with carbon as the major alloying element. The steel will be stronger and stiffer when the percentage of carbon is greater. High-carbon steels are generally unfeasible for use as work-piece materials in stamping operations because their high resistance to plastic deformation.

Steel production methods in Figure 1, influence the properties of the steel produced. The three common methods of steel production are the open-heart process, the electric-furnace process, and the Bessemer-converter process. Most steel used in stamping operations comes from open-heart furnace.

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

(a) i. There are several types of properties of the metals. State five (5) properties of metals and explain their definitions briefly.

(10 marks)

ii. Explain briefly the effects of cold rolling operation.

(6 marks)

iii. The Figure 1 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 1(Production of steel) the types of furnaces on page 2.

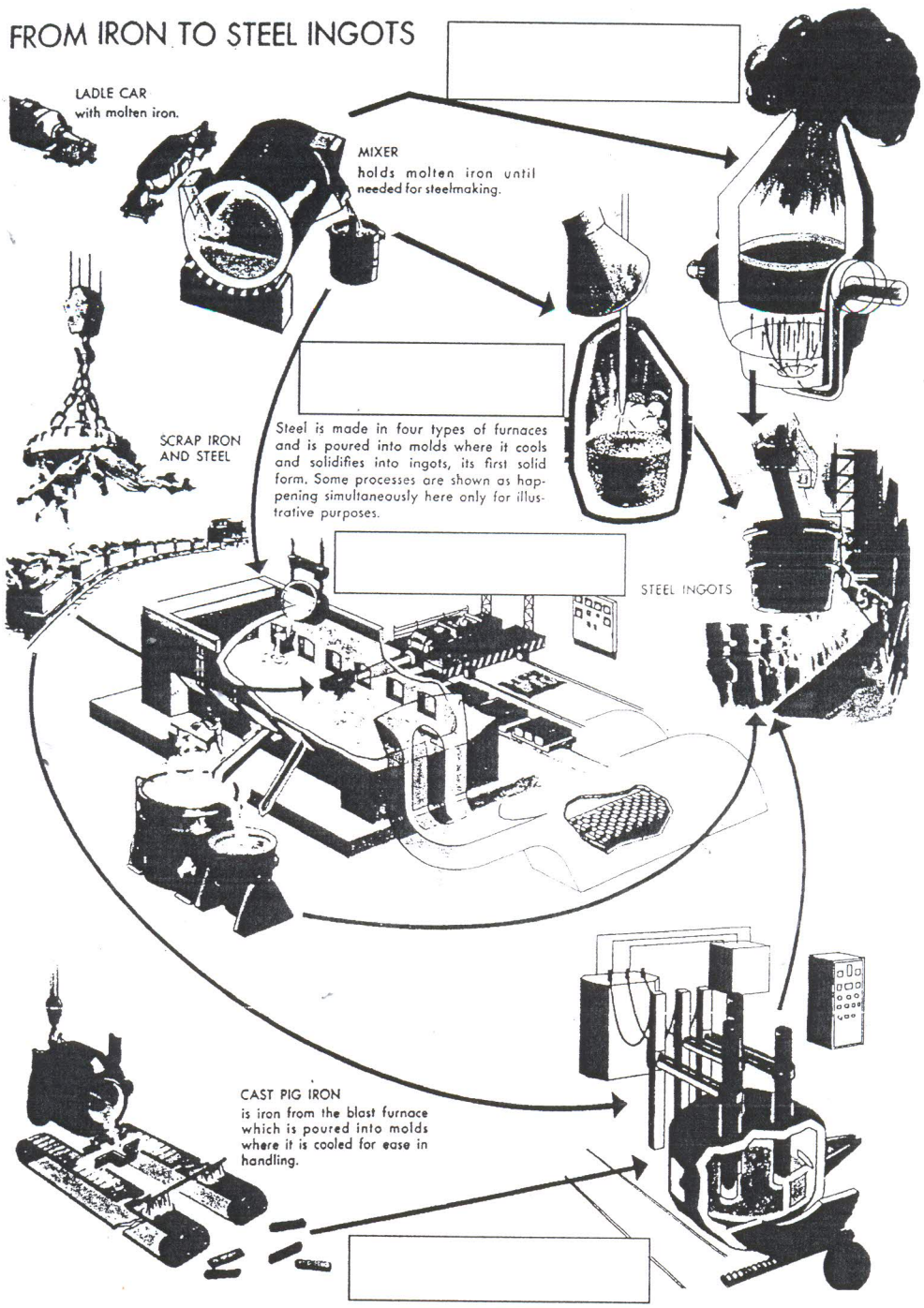

Figure 1: Production of Steel

(4 marks)

Question 2

(a) With reference to Figure 2 (basic drilling alignments), explain briefly the four (4) basic drilling conditions in order to get the correct position while drilling a hole on a workpiece.

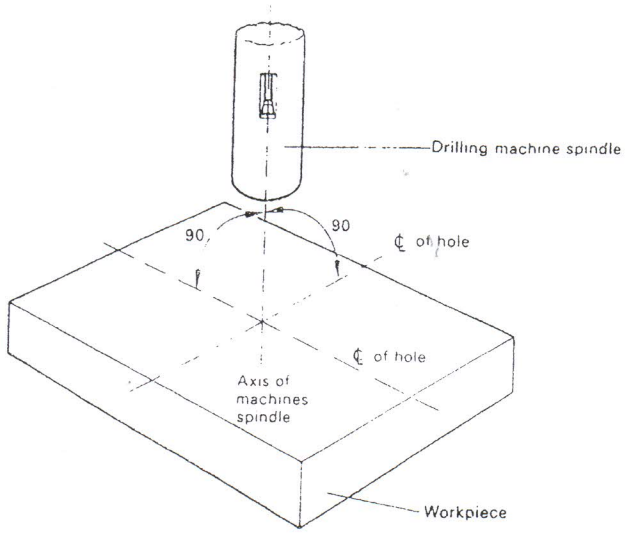

Figure 2: Basic drilling alignments

(8 marks)

(b) In figure 3, name the type of device that commonly use for welding process and fill in the blank.

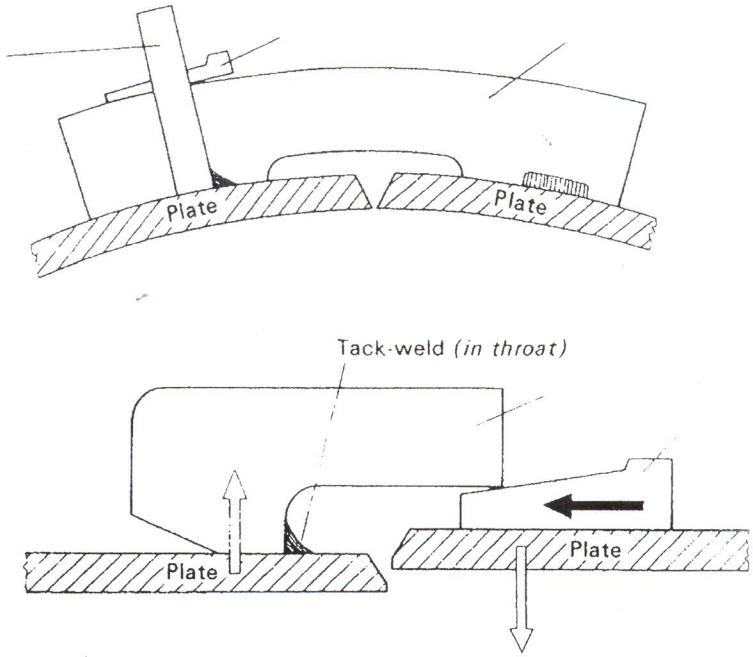

Figure 3

(6 marks)

(c) Illustrate and explain briefly the use of cleats in welding process.

(6 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 4(drum), identify and explain briefly the type of stiffener that is applied on the body of the drum.

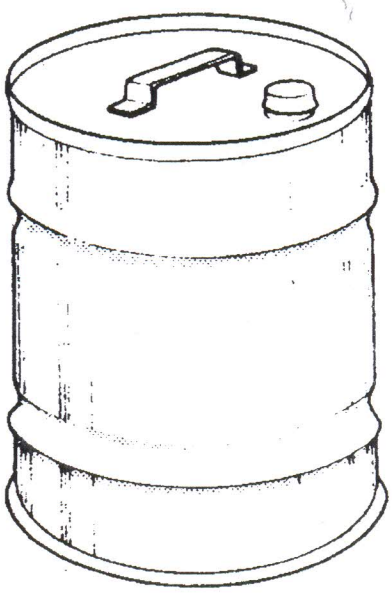

Figure 4: Drum

(5 marks)

(d) Sketch and name the methods of stiffening for the large sheet-metal panels especially to a rigid framework.

(7 marks)

SECTION B (Total: 40 marks)

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

Question 1

(a) You are given an L bracket in Figure 5. State and explain briefly the most appropriate fabrication process that you would do to complete the fabricating task of the Cover Bracket.

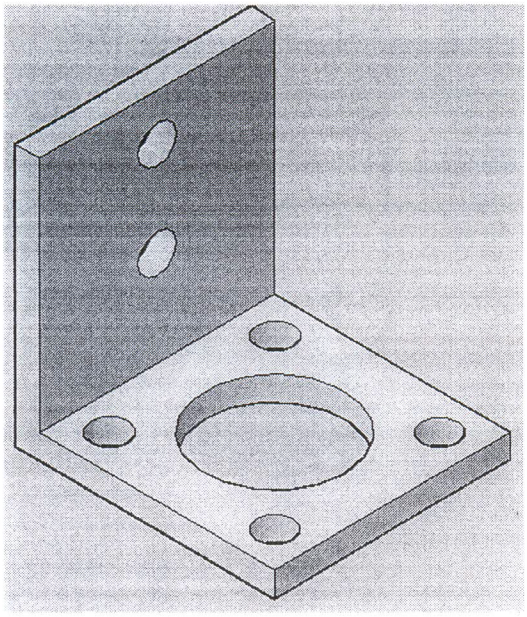

Figure 5: L Bracket

(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 in minimize it. One common problem is the closeness of a hole to the edge of a part, which if too close causes bulging along the edge.

Another frequent problem that occurs on strip and bar stock is camber due to off-center punching. Figure 6 (Distortion resulting from off-center punching) shows the type of distortion that will result.

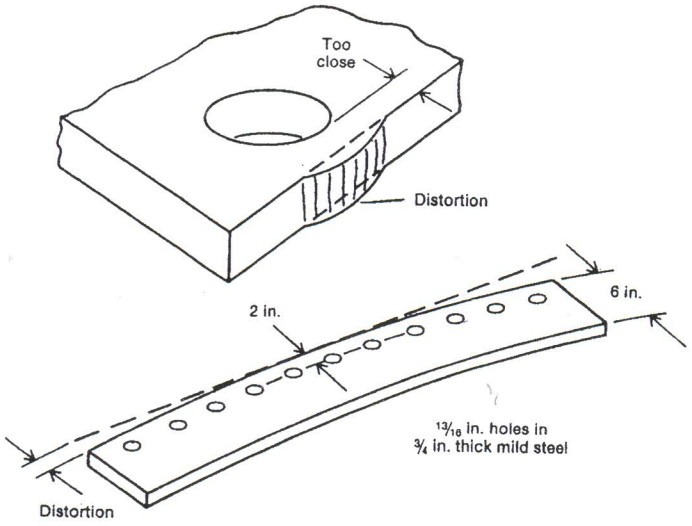

Figure 6: Distortion resulting from off-center punching

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

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

(4 marks)

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

(4 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.

In an automatic part nesting system 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.

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

i. There are four (4) levels of flexible manufacturing system. State two (2) levels only.

(4 marks)

ii. What is the fist step in managing the tool requirements in an FMS?

(3 marks)

iii. Illustrate the Automatic nesting system diagram and explain its advantages.

(8 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.

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.

In the following Figure 7(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).

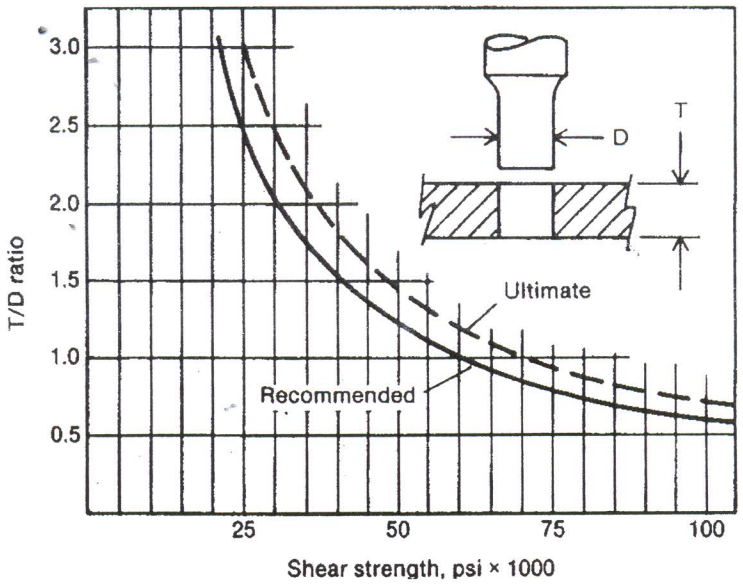

Figure 7: Ratio of material thickness to punch diameter as a function of shear strength

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

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

1. Shearing
2. Punching

(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?

(3 marks)

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

(3 marks)

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

(6 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.

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.

(4 marks)

ii. How to store raw materials in automatic material loading?

(2 marks)

iii. Why does the FMS need automatic sorting?

(2 marks)

(c) Punching of special-shape holes in sheet metal and plate can be done in many ways. Figure 8 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.

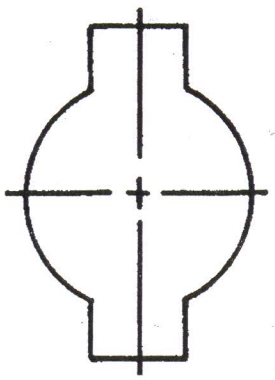

Figure 8: An Electrical pushbutton

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 8, explain briefly how to lower the tooling cost?

(2 marks)

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

(5 marks)

END OF QUESTION