



UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2010 SESSION

SUBJECT CODE	:	FFD 12201
SUBJECT TITLE	:	METAL FABRICATION PROCESSES
LEVEL	:	DIPLOMA
TIME / DURATION	:	4.00 pm – 6.00 pm (2 HOURS)
DATE	:	26 APRIL 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 question in Section A. For Section B, answer four (4) questions 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**

Stainless steel is a high quality product which is widely used in many applications because of its excellent corrosion resistance.

To achieve good corrosion resistance stainless steels have a minimum addition of 12% of chromium. This results in the formation of an inert, invisible oxide films on the metal surface which prevents corrosion

In addition to corrosion resistance, stainless steels must also be suitable for component manufacture and so have:

- Good forming characteristics.
- Good welding characteristics.

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

- (a) i. List down 5 (five) applications of stainless steel in industries. (5 marks)
- ii. List down 3 (three) properties of metals. (3 marks)
- iii. State the meaning of 'lustre' (2 marks)

Question 2

- (a) Label the blank space provided for an MMAW process as shown in Figure 1.

(6 marks)

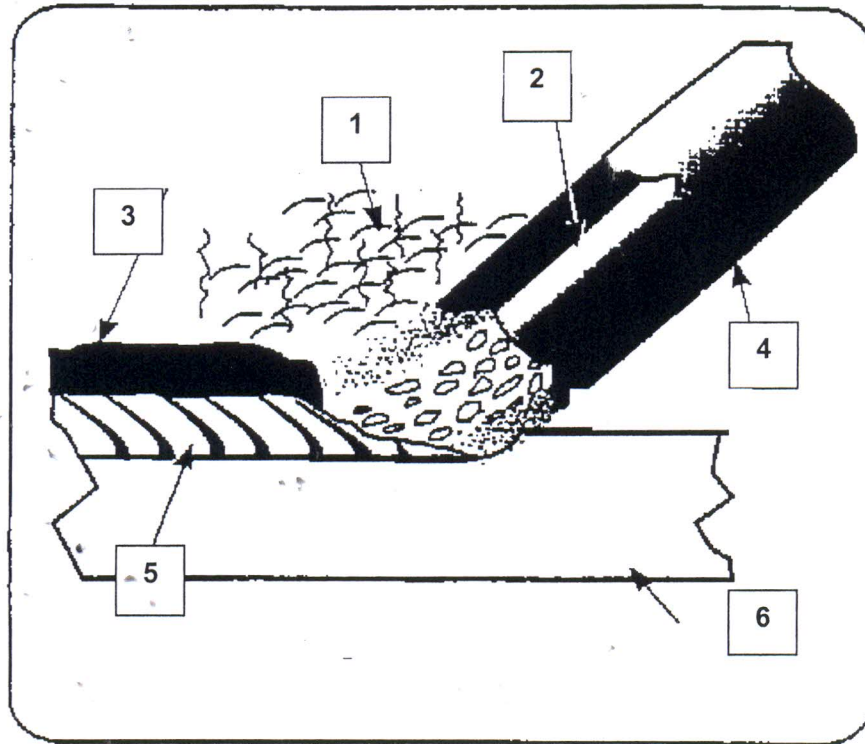


Figure 1 – Manual Metal Arc Welding (MMAW)

- (b) For stainless steel welding there are two main types of electrode coating, they are basic and rutile.

- i. Provide 2 (two) characteristics of each coating

(4 marks)

Question 3

- (a) The GMAW process is a versatile technique which can be useful for stainless steel welding. Figure 2 shows complete Gas Metal Arc Welding (GMAW) equipment.

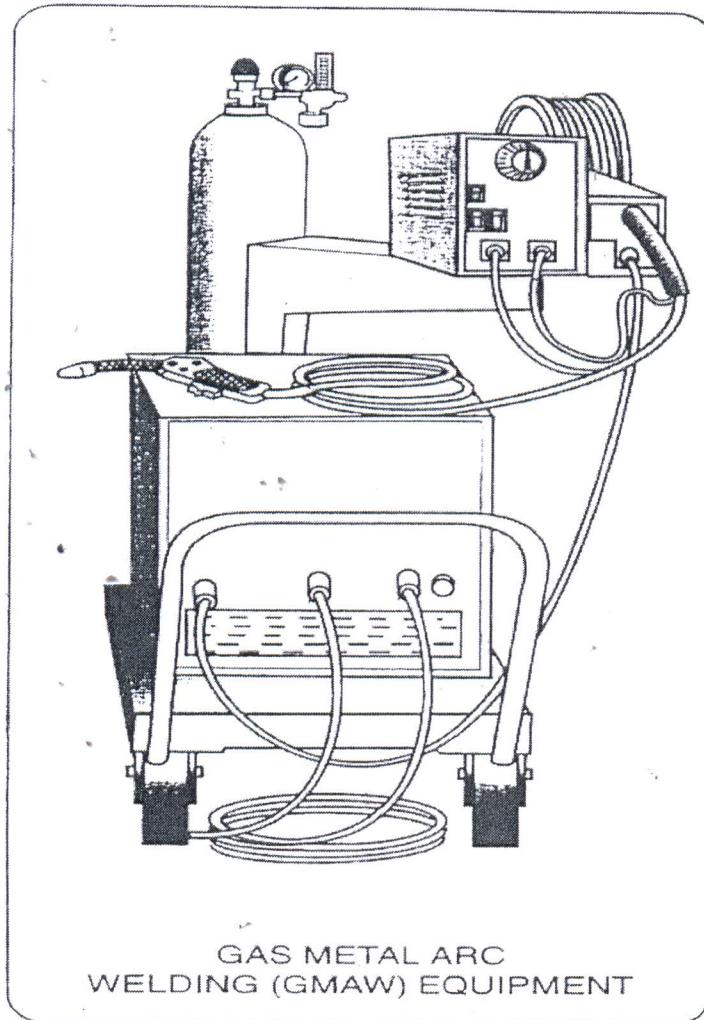


Figure 2 – Gas Metal Arc Welding (GMAW) Equipment

- (i) State 2 (two) main differences between GMAW and GTAW. (4 marks)
- (ii) Name the 2 (two) inert gas used as shielding medium in GTAW. (2 marks)
- (iii) State the usage of inert gas in GTAW. (4 marks)

Question 4

5. The activity within the sheetmetal field is very great. Sheetmetal applications exist in nearly every aspect of a job. Complete by sketching the process and name the type of industry you can find the activity most, in Table 1

(10 marks)

Sketch	Industry Type
i. Riveted joints	Industry : _____
ii. Laser cutting output	Industry : _____
iii. Parts with stretch flanges	Industry : _____
iv. Dressing a grinding wheel	Industry : _____
v. Contour rolling	Industry : _____

Table 1

Question 5

Metal gauge	Thickness, in.	Force, tons, required for punching hole diameters, in., of:														
		1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1
26	0.036	0.35	0.53	0.71	0.88	1.1	1.2	1.4	1.6	1.8	1.9	2.1	2.3	2.5	2.7	2.8
18	0.048	0.47	0.71	0.94	1.2	1.4	1.7	1.9	2.1	2.4	2.6	2.8	3.1	3.3	3.5	3.8
1/16 or 16	0.060	0.59	0.89	1.2	1.5	1.8	2.1	2.4	2.7	2.9	3.2	3.5	3.8	4.1	4.4	4.7
14	0.075	0.74	1.1	1.5	1.9	2.2	2.6	2.9	3.3	3.7	4.1	4.4	4.8	5.2	5.5	5.9
12	0.105	1.0	1.6	2.1	2.6	3.1	3.6	4.1	4.7	5.2	5.7	6.2	6.7	7.2	7.7	8.3
1/8 or 11	0.120	1.2	1.8	2.4	3.0	3.5	4.1	4.7	5.3	5.9	6.5	7.1	7.7	8.3	8.8	9.4
10	0.135		2.0	2.7	3.3	4.0	4.6	5.3	6.0	6.6	7.3	8.0	8.6	9.3	10.0	10.6
3/16	0.187		2.8	3.7	4.6	5.5	6.5	7.4	8.3	9.2	10.2	11.1	12.0	12.9	13.8	14.8
1/4	0.250			4.9	6.2	7.4	8.6	9.8	11.0	12.3	13.5	14.8	16.0	17.2	18.5	19.7
5/16	0.312				7.8	9.2	10.8	12.3	13.8	15.4	16.9	18.4	20.0	21.5	23.0	24.6
3/8	0.375					11.1	13.0	14.8	16.6	18.5	20.3	22.1	24.0	25.8	27.7	29.5
1/2	0.500						17.2	19.7	22.1	24.6	27.1	29.5	32.0	34.4	36.9	39.4
5/8	0.625									30.8	33.8	36.9	40.0	43.0	46.1	49.2
3/4	0.750										40.6	44.3	48.0	51.9	55.4	59.0
7/8	0.875											51.6	56.0	60.2	64.6	69.0
1	1.00												64.0	68.8	73.8	78.8

Table 2 – Required Force for Punching Mild Steel Plate

Material	Chart multiplier	Ultimate Shear	strength, psi Tensile
Aluminum:			
1100-O	0.19	9,500	13,000
1100-H14	0.22	11,000	18,000
3003-H14	0.28	14,000	22,000
2024-T4	0.82	41,000	68,000
5005-H18	0.32	16,000	29,000
6063-T5	0.36	18,000	30,000
6061-T4	0.48	24,000	35,000
6061-T6	0.58	29,000	41,000
7075-T6	0.98	49,000	82,000
Brass, rolled sheet:			
Soft	0.64	32,000	46,000
1/2 hard	0.88	44,000	65,000
Hard	1.00	50,000	78,000
Copper:			
1/4 hard	0.50	25,000	38,000
Hard	0.70	35,000	50,000
Steel:			
Mild A-7 struc- tural	1.00	50,000	65,000
Boiler plate	1.10	55,000	70,000
Structural A-36 ..	1.20	60,000	85,000
Structural COR- TEN (ASTM A242)	1.28	64,000	90,000
Cold rolled C-1018	1.20	60,000	85,000
Hot rolled C-1050	1.40	70,000	100,000
Hot rolled C-1095	2.20	110,000	150,000
Hot rolled C-1095, annealed	1.64	82,000	110,000
Stainless 302, annealed	1.40	70,000	90,000
Stainless 304, cold rolled	1.40	70,000	90,000
Stainless 316, cold rolled	1.40	70,000	90,000

Table 3 – Chart Multiplier

- (a) To get the required force for punching a mild steel plate of various thicknesses, you may refer to the table presented in Table 2. To punch materials with different shear strength it is necessary to use a chart multiplier presented in Table 3. By referring to the both chart given, you will be able to calculate the force needed. Calculate the force needed for the following materials

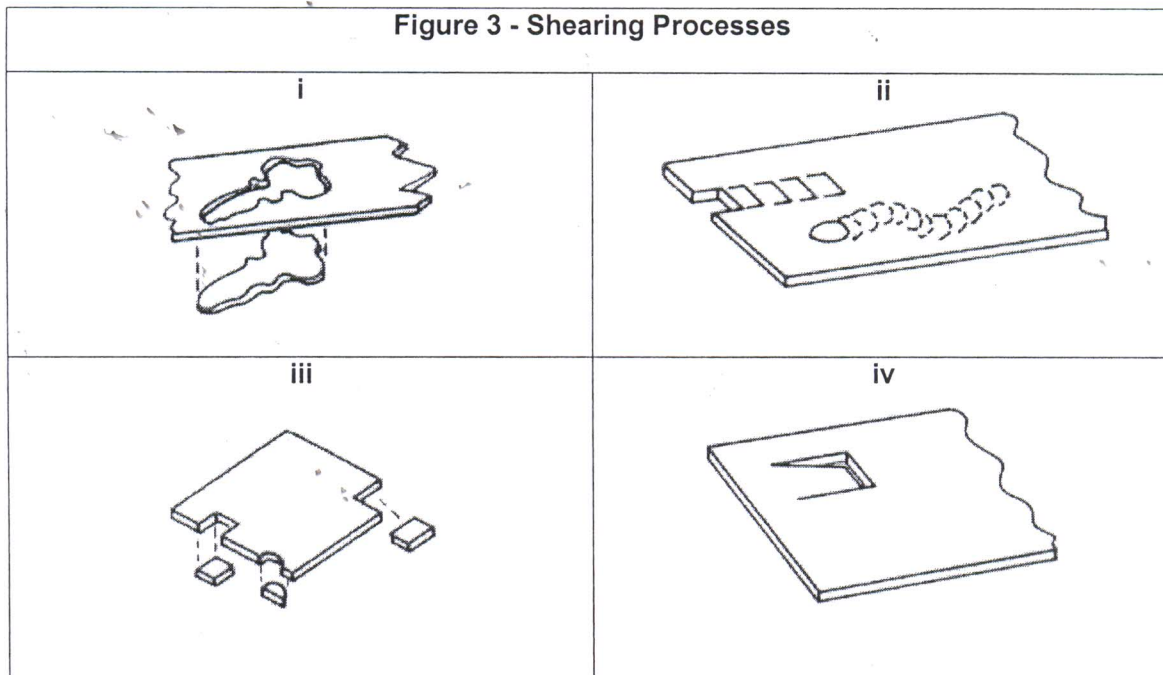
- i. Aluminium 6063-T5 : $\frac{3}{4}$ in. diameter on a $\frac{1}{4}$ in. thickness
- ii. Mild A-7 Structural : $\frac{1}{4}$ in. diameter on a $\frac{1}{4}$ in. thickness
- iii. Stainless 302 annealed: $\frac{1}{4}$ in. diameter on a $\frac{1}{4}$ in. thickness
- iv. Copper $\frac{1}{4}$ hard : $\frac{5}{8}$ in. diameter on a $\frac{1}{2}$ in. thickness
- v. Brass soft : $\frac{1}{2}$ in. diameter on a $\frac{1}{4}$ in. thickness

(10 marks)

Question 6

- (a) Shearing is among the most common processes performed in sheetmetal works. Name the correct operation performed using the same "shearing" principles as shown in Figure 3.

(4 marks)

**Figure 3 - Shearing Processes**

- (b) Piercing is one of the operation perform in sheetmetal industries.
- Determine the type of each piercing operations given in the drawing (as shown in Figure 4).
(3 marks)
 - Describe its usage.
(3 marks)

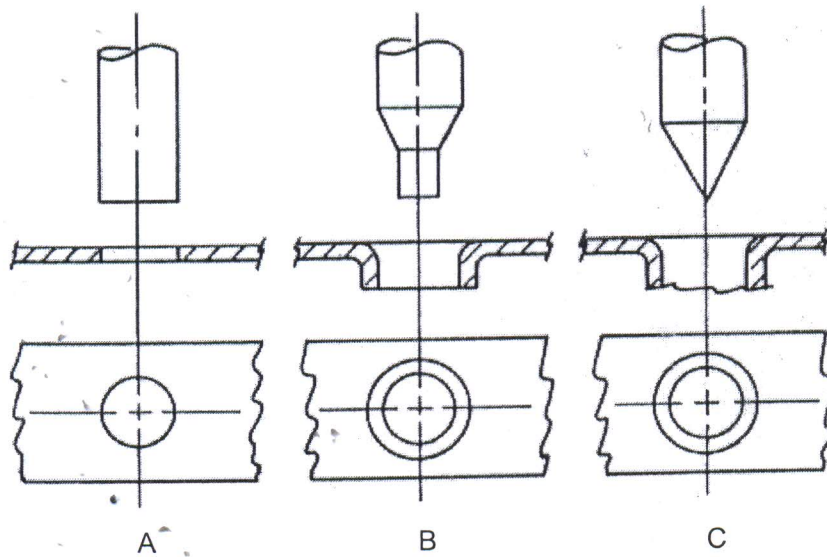


Figure 4 - Types of piercing operations

SECTION B (Total: 40 marks)**INSTRUCTION: Answer any FOUR (4) questions only.****Please use the answer booklet provided.****Question 1**

(a) Rolling is the term used for the process employed to produce cylindrical and conical jobs or large radius bends. Rolling is carried out on machines called rolls.

i. Name 2 (two) types of roller bending machines.

(2 marks)

ii. Describe each type of roller bending machine

(8 marks)

Question 2

(a) Mechanical properties are of great importance in the design, fabrication and maintenance of structure and machines. Various mechanical tests provide immense value to the engineer, metallurgist, technologist, technician and tradesman.

i. Name 4 (four) mechanical properties.

(4 marks)

ii. Describe briefly any 2 (two) of the mechanical properties.

(6 marks)

Question 3

(a) Thoriated tungsten electrodes are designed chiefly for direct current electrode negative work and are therefore ideally suited to the welding of stainless steel.

i. State 4 (four) advantages of thoriated tungsten electrode compare to other tungsten electrodes.

(4 marks)

ii. Name 2 (two) shielding gases used in the welding of stainless steel.

(2 marks)

iii. State the cylinder color for the 2 (two) shielding gases.

(2 marks)

- iv. State the chemical symbol of the 2 (two) shielding gases.

(2 marks)

Question 4

- (a) The tooling used in bending operations results in the metal being deformed in localized areas only. The localized stresses occur only in the bend radius. The remaining flat part of the blank is not stressed during bending. To describe further of a bending operation provide the following,

- i. Illustrate with a diagram showing neutral axis, tension and compression, and no stress line.

(6 marks)

- ii. Explain what is meant by a "neutral axis"

(4 marks)

Question 5

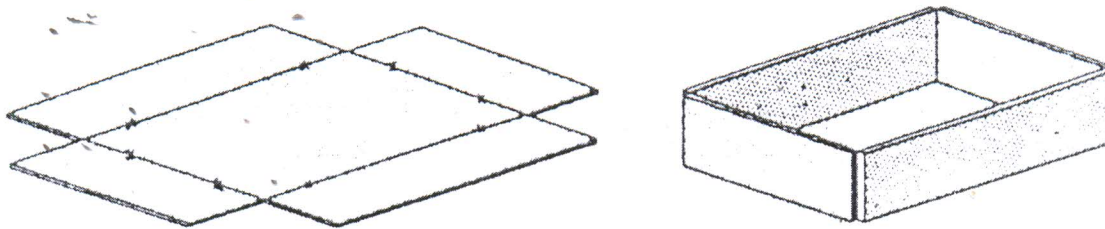


Fig 5 – Utility Box Container

- (a) The diagram above shows a 'utility box container' which is made of mild steel. The thickness of the sheet used for its body is 1.5 mm. The box measures 300 mm X 200 mm. X 100 mm. The 'utility box container' is supposed to have a lid. The pattern layout given may help you. Please prepare the necessary in order to complete the 'utility box container',

- (i) List down the steps and processes in order to complete the 'utility box container'.

(6 marks)

- (ii) Propose the type of lid that you will prepare for the 'utility box container'.

(4 marks)

END OF QUESTIONS