



**UNIVERSITI KUALA LUMPUR
Malaysia France Institute**

**FINAL EXAMINATION
JANUARY 2014 SESSION**

SUBJECT CODE : FFB 22102
SUBJECT TITLE : SHEETMETAL ENGINEERING
LEVEL : BACHELOR
TIME / DURATION : 9.00 am - 11.30 am
(2 ½ HOURS)
DATE : 08 JUN 2014

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 **THREE (3)** question only.
6. Answer **ALL** questions in English

THERE ARE 4 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

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

Question 1

- (a) Extrusion is defined as the process of shaping material, such as aluminum, by forcing it to flow through a shaped opening in a die. Extruded material emerges as an elongated piece with the same profile as the die opening.
- i. List down **SIX (6)** factors that affect extrusion. (6 marks)
 - ii. Name the **TWO (2)** types of extrusion processes. (2 marks)
- (b) Write in details the **TWO (2)** types of extrusion (8 marks)
- (c) The image below is among the most common processes performed in sheetmetal works. Name and describe the process shown in **Figure 1**.

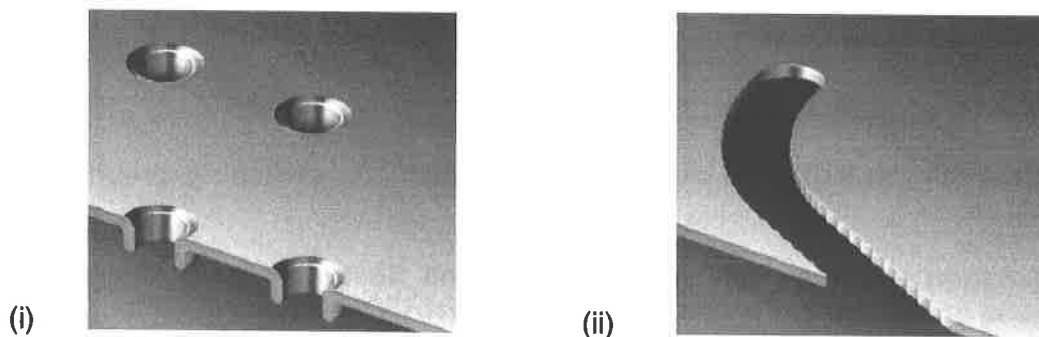


Figure 1 Common Product in Sheetmetal Works

(4 marks)

Question 2

The tensile strength of the material, type of tooling, and the type of bending greatly influence the amount of springback. Natural springback occurs at the point of the optimum die width.

- (a) Describe why we must predict springback.

(4 marks)

Table 1: Springback Multiplier for Various Materials

	Material Type	Factor Values
1.	Stainless steel	2.0
2.	Aluminium	1.5
3.	Cold-rolled steel	1.0
4.	Hot-rolled steel	0.75

- (b) Referring to springback multiplier for various materials in Table 1

- i. Calculate the amount of springback for the following items,

Mt. = 0.8 mm

Rp. = 20 mm

∠ = 90 degrees

Material = Aluminium

- ii. Mt. = 2.5 mm

Rp. = 30 mm

∠ = 90 degrees

Material = Hot-rolled steel

(6 marks)

Question 3

Tonnages can be computed quickly and accurately. Remember, charts tend to be inaccurate. Calculate the following in order to predict the exact tonnage per. inch. Refer to the table attached for calculation purposes.

Table 2
Tonnage Multiplier for Various Materials

	Material Type	Factor Values
1.	Stainless steel type 304	1.4
2.	Aluminium 6061 T6	1.28
3.	Cold-rolled steel	1.00
4.	Aluminium 5052 H32	0.50

Referring to Table 2 of Tonnage Multiplier for Various Materials, calculate the tonnage per. inch for the following items,

- i. Material type = Stainless steel type 304
 Material thickness = 0.050
 Punch radius = 0.030
 Die width = 0.236
 Bend length = 6.475

(5 marks)

- ii. Material type = Aluminium 6061 T6
 Material thickness = 0.5
 Punch radius = 0.030
 Die width = 0.236
 Bend length = 10.685

(5 marks)

SECTION B (Total: 60 marks)

INSTRUCTION: Answer THREE (3) questions only.

Please use the answer booklet provided.

Question 1

The pyramid type bending roll consists of three rolls. The lower two of similar diameter are mounted side by side on the machine frame.

(a) What is the name given to the third roller and state its function. (8 marks)

(b) Clearly sketch the roll arrangement in order to determine the classification. (6 marks)

(c) Provide the distinct advantages of the two bending rolls. (6 marks)

Question 2

In selection of lubricants, consideration should be given to the work metal and its behavior as well as to die design.

(a) State the **THREE (3)** additional factors that must be analyzed in the selection of lubricants. (6 marks)

(b) State the **FOUR (4)** industrial requirements that have to be met in the selection of forming lubricants. (8 marks)

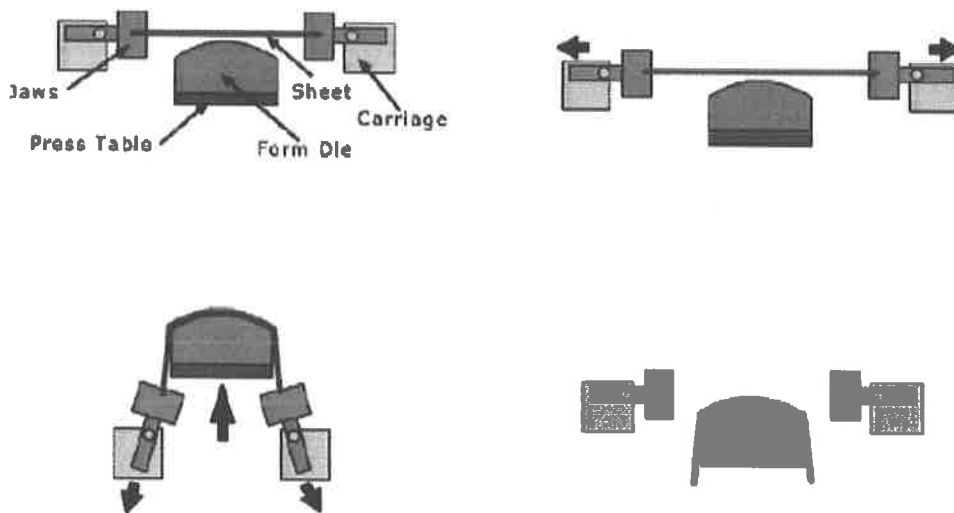
(c) List down the **SIX (6)** principal classes of materials that may be present in a drawing compound. (6 marks)

Question 3

Sheetmetal industry has undergone a tremendous evolution; **Figure 3** shows one of the processes in the industry.

Based on the process in **Figure 3**, answer the following,

- (a) Name the process
- (b) Label the process
- (c) How it is conducted
- (d) Main use, and
- (e) Advantages



Sheetmetal Industry Process

Figure: 3

(20 marks)

Question 4

- (a) Often bend allowances are calculated for a sheet metal part and used to make costly tooling or production parts that require a lot of labor to produce. A scrap tool or production run can be very costly, much more so than a test piece. Suggest the best way to shear a piece to an exact length, and then form it using the exact process that will be used to create the part.

(6 marks)

- (b) A side view drawing in **Figure 4** shows a 'bracket for Wash Trough'. In order to fabricate the item a true total developed length is required. Assuming that the

thickness of the bracket is 4.0mm and the die opening size is 32 mm, calculate the true total develop length. The bending calculation in Table 1 is referred.

(14 marks)

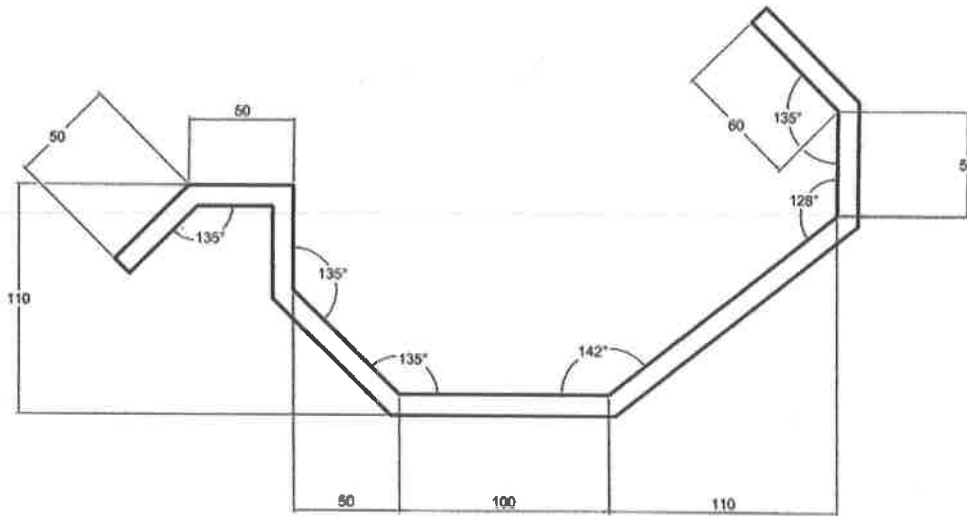


Figure 4
Side View Drawing
Bracket for Wash Trough

Table 3
Table for Bending Calculation

Th mm	Die mm	Ri mm	F t/m	b mm	Bending Angle											
					165°	150°	135°	120°	105°	90°	75°	60°	45	30	15	0
2.5	12	2	42	8.5	-0.5	-1	-1.6	-2.3	-3.3	-4.7	-4	-3.2	-2.5	-1.8	-1.1	-0.4
	16	2.6	29	11	-0.5	-0.9	-1.5	-2.3	-3.3	-4.8	-3.9	-3	-2.1	-1.2	-0.3	0.6
	20	3.3	20	14	-0.4	-0.9	-1.5	-2.3	-3.4	-5	-3.9	-2.8	-1.7	-0.6	0.5	1.6
	25	4	15	17.5	-0.4	-0.9	-1.5	-2.3	-3.5	-5.2	-3.9	-2.6	-1.4	-0.1	1.2	2.5
3.0	32	5	11	22	-0.4	-0.9	-1.5	-2.4	-3.6	-5.6	-4	-2.4	-0.8	-0.7	2.3	3.6
	16	2.6	49	11	-0.6	-1.2	-1.9	-2.8	-4	-5.7	-4.7	-3.8	-2.9	-2	-1.1	-0.1
	20	3.3	32	14	-0.5	-1.1	-1.8	-2.8	-4	-5.8	-4.7	-3.6	-2.5	-1.3	-0.2	0.9
	25	4	23	17.5	-0.5	-1.1	-1.8	-2.8	-4.1	-6	-4.7	-3.4	-2.1	-0.7	-0.6	1.9
	32	5	16	22	-0.5	-1.1	-1.8	-2.8	-4.2	-6.3	-4.7	-3.1	-1.5	0.1	1.7	3.3
4.0	40	6.5	12	28	-0.5	-1.1	-1.8	-2.9	-4.5	-6.8	-4.8	-2.8	-0.8	1.3	3.3	5.3
	20	3.3	66	14	-0.7	-1.6	-2.5	-3.7	-5.3	-7.5	-6.3	-5.2	-2	-2.8	-1.6	-0.4
	25	4	43	17.5	-0.7	-1.5	-2.5	-3.7	-5.3	-7.7	-6.3	-4.9	-3.5	-2.1	-0.7	0.7
	32	5	30	22	-0.7	-1.5	-2.4	-3.7	-5.4	-7.9	-6.3	-4.6	-2.9	-1.2	0.4	2.1
	40	6.5	22	28	-0.7	-1.4	-2.4	-3.7	-5.6	-8.4	-6.3	-4.2	-2.1	0	2.1	4.2
50	8	16	35	-0.6	-1.2	-2.4	-3.7	-5.8	-8.9	-6.4	-3.9	-1.3	1.2	3.7	6.2	

Th: Thickness of plate Die: Opening Distance of the Matrix Ri: Internal radius of bend F: Force to bend b: Slant distance of vee matrix

END OF QUESTION

