UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

JULY 2010 SESSION

SUBJECT CODE	:	FFB 32102
SUBJECT TITLE	:	SHEETMETAL ENGINEERING
LEVEL	:	BACHELOR
TIME / DURATION	:	2.30pm – 3.00pm (2.5 HOURS)
DATE	:	11 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 three (3) questions only.

6. Answer all questions in English

THERE ARE 6 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

INSTRUCTION: Answer ALL questions.

Please use the answer booklet provided.

Question 1

(a)   'Springback' must be compensated for in bending operations, otherwise the operation won't yield parts of the desired dimensions and shape.

      i.   State why it must be compensated?

      ii.   Write an issue in view to the scenario and provide a solution

(6 marks)

(b)   Cold rolling of sheets produces anisotropy because of alignment of impurities, inclusions, and voids which is called mechanical fibering. The notes described are intended to point out four issues.

      i.   State three issues only

      ii.   Provide a solution in view to the issues.

(8 marks)

Question 2

(a)   Shearing is among the most common processes performed in sheetmetal works. Name the correct operation performed using the same "shearing" principles as in (Figure 2A-a).
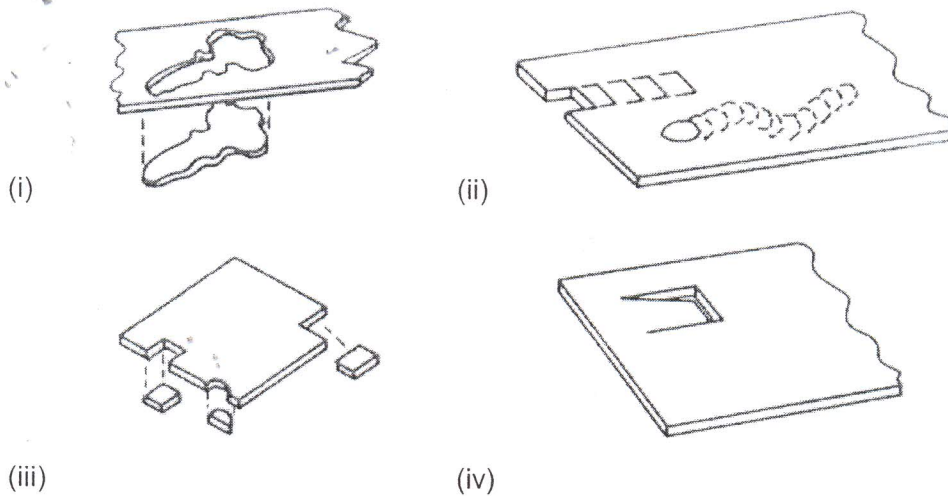

(i)   (ii)

(iii)   (iv)

Figure: 2A-a
Shearing Processes

(2 marks)

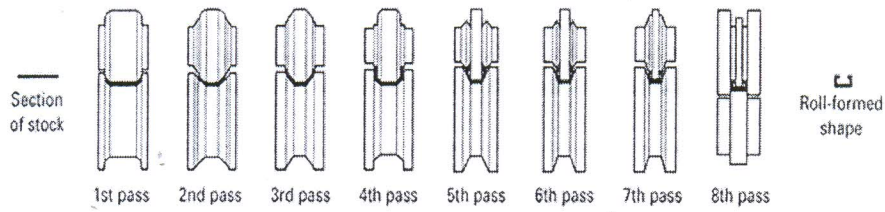(b)   i.   Determine the type and process shown in fig.2A-b.

Figure: 2A-b

ii.   Determine the type and process shown in fig.2A-c.
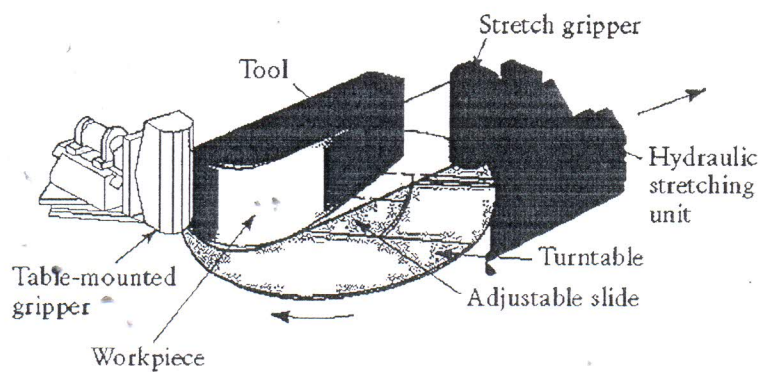

Figure: 2A-c

(8 marks)

Question 3

(a)   Press machine is always a necessity in sheetmetal work. What are the greatest needs in terms of problem solving that exist in the area of sheet metal and plate fabrication especially for a press machine?

(6 marks)

(b)   Press brake would normally come with a set of punches for press work. State the areas that need to be considered in the tooling management for a punching process.

(3 marks)

(c)   'Hemming' and 'Seaming' are 2 similar processes usually performed in sheetmetal work. What is the function of 'hemming' and 'seaming'?

(4 marks)

SECTION B (Total: 60 marks)

INSTRUCTION: Answer THREE (3) questions only.

Please use the answer booklet provided.

Question 1

Force, tons, required for punching hole diameters, in., of:

Metal gage	Thickness, in.	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
20	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 1B-a
Punching Force Chart

(a)   In order to get the exact tonnage force, you may refer to (Table 1B-a) 'Punching Force Chart'. By referring to the chart you will be able to calculate the tonnage needed for the task given below;

To punch a hole on mild steel plate.

i. $7/8$ in. diameter on a $3/8$ in. thickness

ii.   1 in. diameter on a $5/8$ in. thickness

(8 marks)

Material	Chart multiplier	Ultimate strength, psi	
		Shear	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

Table 1B-b
Chart Multiplier

(b)   Different metal requires different punching tonnage. By referring to the chart multiplier in Table 1B-b calculate the tonnage needed for punching the following hole on aluminum plate
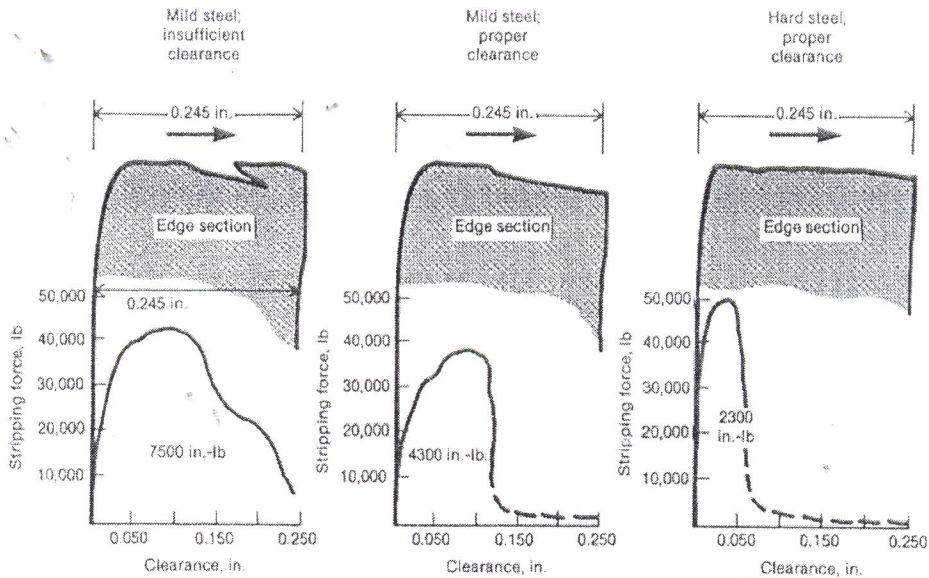
i.   round hole $\frac{1}{4}$ in diameter on $\frac{1}{4}$ in. thick aluminum 5005-H18 plate

ii.   round hole $\frac{5}{8}$ in. diameter on 3/16 thick aluminum 7075-T6 plate.

(8 marks)

(d)   In a shearing process most likely there will be an issue which arises from the process. One of the issues is 'secondary shear'. Describe what is "secondary shear"?

(4 marks)

Question 2

Figure 2B-a
Stripping Force Clearance

(a)   The graph plotted in fig 2B-a shows a result obtained from a 'drawing' process. Provide a clear analysis for a mild steel with proper clearance and hard steel with proper clearance with regards to the effects of clearance and material hardness?

(5 marks)

(b)   One of the obvious problems in a 'drawing process' is 'angular fracture. Describe what is 'angular fracture'?

(5 marks)

(c)   Clearance is always the answer to produce quality product in sheetmetal work. What would happen to an excessive clearance towards the life of a tool?

(5 marks)

(d)   Among the common terms in sheetmetal process is 'anisotropy'. What is meant 'anisotropy?'

(5 marks)

Question 3

(a)   When developing a flat blank length, there is a length of the part that does not change. This length is called the 'neutral axis'. With the aid of sketches describe what is known as 'neutral axis'

(6 marks)

(b)   Bending of steel sheet and plate into plain cylinders, cones, ovals, multiple-ribbed or beaded cylinder and other circular shapes can be handled readily on modern bending rolls. Name the **TWO** (2) classes of bending rolls.

(4 marks)

(b)   Describe the differences and advantages of the **TWO** (2) classes of bending rolls.

(10 marks)

Question 4

Th mm	Die mm	Ri mm	F t/m	b mm	165°	150°	135°	120°	105°	90°	75°	60°	45°	30°	15°	0°
	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
2.5	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
	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	+3.9

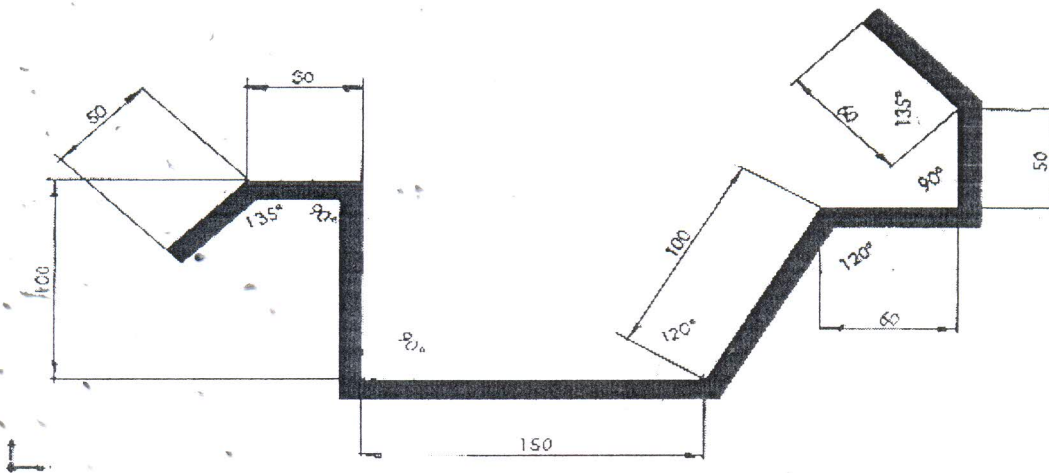**Figure 4B-a**
Bending Calculation Table

Figure 4B-b
Prototype Shape

(a)   Figure 4B-a, shows a bending calculation table usually utilize by operators in a bending operation process. An operator has to prepare a prototype of the shape in 4B-b, by referring to the bending calculation table prepare the following on a 2.5 mm thick low carbon steel and the recommended die size is 20mm ;

i.   Total length.

ii.   Actual total length to form the shape

(20 marks)

END OF QUESTION