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SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

JANUARY 2011 SESSION

SUBJECT CODE	:	FGB 21102/FGB 21103
SUBJECT TITLE	:	MANUFACTURING PROCESS
LEVEL	:	BACHELOR
TIME / DURATION	:	3.30pm – 6.00pm (2.5 HOURS)
DATE	:	10 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. 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. Show the works.
5. Answer all questions in English.

THERE ARE 4 PAGES OF QUESTIONS AND 1 PAGE OF APPENDIX, EXCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

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

Question 1

(a) Define springback in sheet metal bending. State the two mechanical properties materials that are most important in influencing springback.

(7 marks

(b) Explain two ways to mitigate or prevent shrinkage in a casting process. Name two metals that may not shrink.

(7 marks)

(c) Define L/D ratio in injection molding. Why it is very important parameter in injection molding machine selection?

(6 marks)

Question 2

(a) Briefly describe two different characteristics for product produced from powder metallurgy and machining process.

(5 marks)

(b) Explain a difference between roughing and finishing operations in a machining process.

(4 marks)

(c) Give three advantages of brazing compared to welding process.

(6 marks)

(d) Give two recommendations on how to increase corrosion resistance of a component which is going to be designed.

(5 marks)

SECTION B (Total: 60 marks)

INSTRUCTION: Answer THREE (3) questions only.
Please use the answer booklet provided.

Question 3

(a) What are the main distinguishing features of the four types of permanent mold-casting processes? If necessary, use sketches for better explanation.

(8 marks)

(b) Suggest two ways of making a thick-walled metal tube. Make simple sketches to show the proposed deformation methods.

(6 marks)

(c) Draw simple sketches to differentiate between three types of milling machining processes as listed below:

i. Slab / Arbor milling
ii. Face milling
iii. End milling.

(6 marks)

Question 4

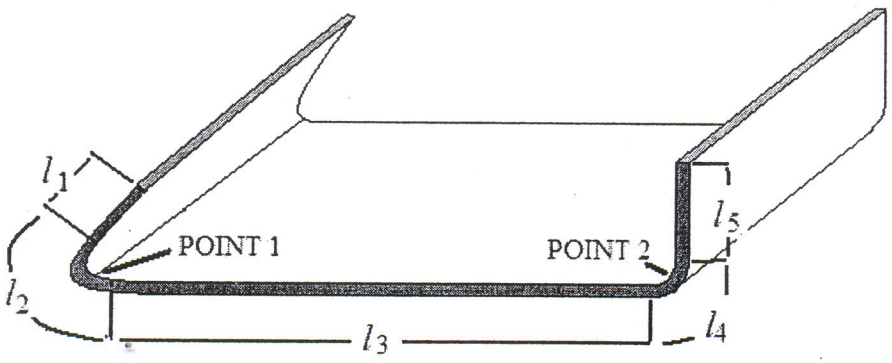
(a) A 0.5 m wide sheet of aluminum is reduced in thickness from 6 mm to 4 mm in two passes through a rolling mill. The thickness is reduced 1.0 mm during each pass. The initial sheet is 1 m long. Neglect the effects of friction and the width is maintained. Estimate the output length of the 4 mm thick sheet. State your assumption, if made.

(10 marks)

(b) The sheet metal part shown in the figure below is to be made from 2 mm thick sheet metal. Find the length of unfold strip (L_T).

Given:

- Length; l_1= 25 mm ; l_3= 70 mm; l_5= 30 mm
- At point 1: Bending radius, R_1= 3 mm & Bending angle, α_1 = 45°
- At point 2: Bending radius, R_2 = 10 mm & Bending angle, α_2= 90°



(10 marks)

Question 5

A 100 mm wide, 600 mm long of cast iron is machined by slab milling process using HSS cutting tool of 132 mm diameter with seven teeth. Spindle surface speed is fixed at 400 mm/s and feed rate per tooth, ***f*** fixed at 0.25 mm/tooth and 3 mm depth of cut. Specific energy, **E** = 1.97 W.s/mm^3. Assume that extent of the cutter movement from work-piece, l_c equal to half of cutters diameter or l_c = D/2. Find:

i. Rotational speed
ii. Feed rate
iii. Material removal rate
iv. Total cutting time
v. Power requirement

(20 marks)

Question 6

For a metal cutting operation, the tool life was found to vary with the cutting speed as shown in the following table.

Cutting Speed, V (m/min)	Tool Life, T (min)
100	120
130	50

(a) Derive Taylor's tool life equation for this operation. (Hint: $C=VT^n$)

(10 marks)

(b) Estimate the tool life at speed of 3.0 m/s.

(5 marks)

(c) Estimate the cutting speed for tool life of 80 minutes.

(5 marks)

END OF QUESTIONS

APPENDIX

Bend Allowance; $l = (R + (k*t))*\alpha$ (mm) *where;* **R : Bending radius** **t : Sheet metal thickness** **α : Bending angle (radians)** ***k* : k-factor (where $k = 0.5$ if $R/t > 2$ & $k = 0.33$ if $R/t < 2$)**

***N* :Rotational speed of the milling cutter, rpm**
***D* :Cutter diameter, mm or inch**
***n* :Number of teeth on cutter**
***v* :Feed rate, mm/min or inch/min**
***V* :Surface speed of cutter, mm/min of ft/min** $V = (3.14 * D) * N$
***f* : Feed per tooth, mm/tooth or inch/tooth** $f = v / (N * n)$
***l* :Length of cut, mm or inch**
***t* :Cutting time, s or min** $t = (l + l_c) / v$ *where; l_c= extent of the cutter's first contact with work-piece*
MRR= $w * d * v$ **(mm^3/ min or in^3/min)** *where; w = the width of cut and d = depth of cut*
Torque= $(F_c)*(D/2)$ **(N-m or Ib-ft)** **Power= MRR* E (kW or hp)** *where; E = specific energy*

Resin	Clamping force factor; (tonnes/cm^2)
PS	0.155 – 0.31
ABS	0.388 – 0.62
HDPE	0.233 – 0.388
PC	0.465 – 0.775
PBT	0.465 – 0.62

Estimated Clamping Force, F = A*p* * β * C*p*
where;
A*p* : Projected Area
β : Clamping force factor
***Cp* : cavity pressure at the thinnest section**