UNIVERSITI TUN HUSSEIN ONN MALAYSIA

PEPERIKSAAN AKHIR
SEMESTER II
SESI 2008/2009

NAMA MATA PELAJARAN	:	REKABENTUK UNTUK PEMBUATAN & PEMASANGAN
KOD MATA PELAJARAN	:	BDD 4013
KURSUS	:	4BDD
TARIKH PEPERIKSAAN	:	APRIL 2009
JANGKA MASA	:	2 JAM 30 MINIT
ARAHAN	:	JAWAB SEMUA SOALAN DIBAHAGIAN A DAN MANA MANA 3 SOALAN DIBAHAGIAN B.

KERTAS SOALAN INI MENGANDUNGI TIGA BELAS (13) MUKA SURAT

SECTION A

S1 (a) Determine design efficiency for Pneumatic Piston in **Figure S1** by filling **Table 1 in page 7.** Given that costing is RM15.00 per hour.

Note: Please refer to DFA manual Handling & Insertion Chart/worksheet on page 12 and 13)

(12 marks)

(b) Based on initial design in **Figure S1**, you want to make some modification to improve the design, what part you want to eliminate or modify and why?

(8 marks)

S2 (a) Refer to design component in **Figure S2**, explain how to machine separate machines for milling, turning, drilling etc. to complete the final product. (Use some sketch to help your explanation)

(8 marks)

(b) Refer to design component in **Figure S2**, explain how to machine on a single turn/mill centre with counter spindle and dual turret to complete the final product. (Use some sketch to help your explanation)

(8 marks)

(c) Based on you explanation on (a) and (b), what is the advantages (b) approaches compare to (a).

(4 marks)

SECTION B

S3 Product development process involved various individuals and lead by team leader.

(a) What is Two (2) general types of products?

(3 marks)

(b) List five (5) individuals who design and develop product.

(5 marks)

(c) Marketing professional is one of the important people for developing products. Discuss the importance of these personnel in 'divergent thinking' phase when developing products.

(6 marks)

(d) A product will going through its life cycle; introduction, growth, maturity and decline as shown in **Figure S3**. Discuss what happen to the product during the growth and maturity phase.

(6 marks)

S4 Design for Assembly (DFA) is a process by which products are designed with ease of assembly in mind. The reduction of the number of parts in an assembly has the added benefit of generally reducing the total cost of parts in the assembly. Fewer parts mean faster and more accurate assembly, and fewer mistakes.

(a) Describe the importance of DFA at the early stage of design process.

(4 marks)

(b) By minimizing parts count and level of assembly, justify how it could reduce the cost of assembly.

(5 marks)

(c) During handling and assembly of parts, sometimes the process requires two hands for manipulation. Explain in what circumstances need of two hand manipulation?

(5 marks)

(d) Determine value for α and β based on **Figure S4**

(6 marks)

S5 (a) What is Rib in injection molding operations and why rib is very important part in plastic product.

(5 marks)

(b) Refer **Figure S5**, list all the major part in Injection Mould Component

(4 marks)

(c) What is Draft angle and why so important in injection molding operations? Relate you answer with some sketching.

(5 marks)

(d) A batch of 15 cm diameter disks with a thickness of 4 mm, to be molded from ABS in a six-cavity mold. Determine the appropriate machine size in KN unit? (Given the % increase in area due to the runner is 15%, and the recommended injection pressure for ABS is 500 bars or 500 x 10^5 N/m^2)

(6 marks)

S6 (a) What are the two (2) fundamental ways that the parts can be made from sheet metal?

(4 marks)

(b) With some sketching differentiate between these three operation of shearing the external profile of the part;

i) cut-off

ii) part-off

iii) blanking

(6 marks)

(c) You have been given a job to buy a mechanical press machine. What are the considerations you should aware in order to select the machine?

(6 marks)

(d) What are the advantages of using cut-off die?

(4 marks)

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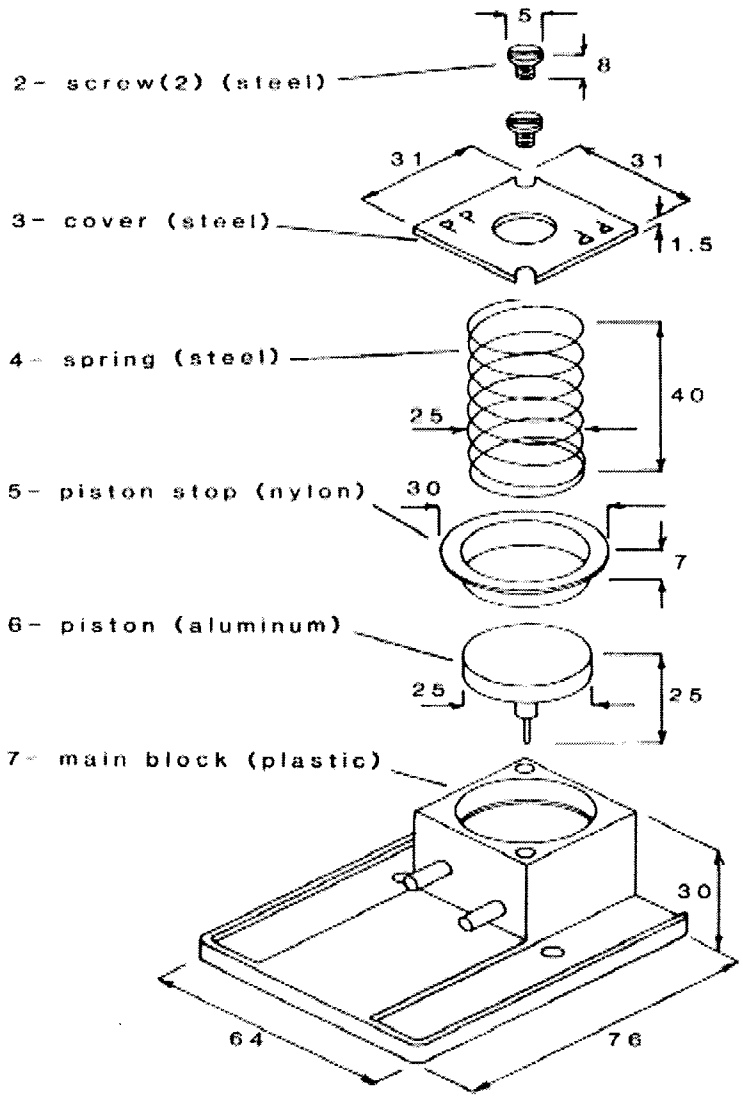

Pneumatic Piston Sub-assembly, dimension in mm

FIGURE S1

TABLE 1 – Please include this table in your answer sheet

DESIGN FOR MANUAL ASSEMBLY - WORKSHEET									
1	2	3	4	5	6	7	8	9	
Part No	Operations	Handling Code	Handling Time	Insertion Code	Insertion Time	Operation Time	Operation Cost	Minimum No Parts	Name of Assembly
						TM	CM	NM	Design Efficiency =

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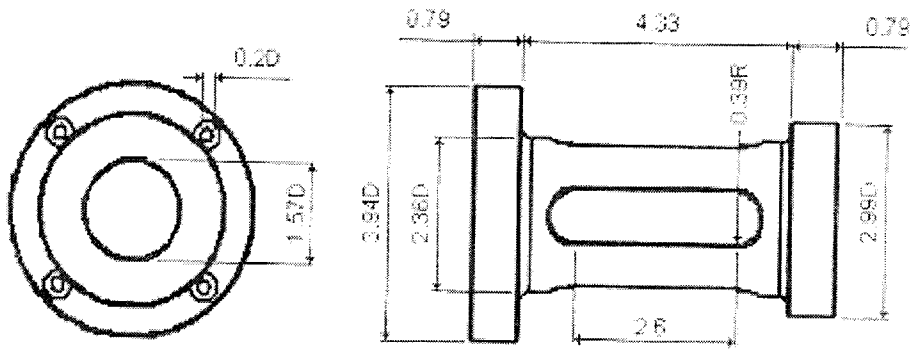

Cylinder Base

D = 1 in (25.4mm)

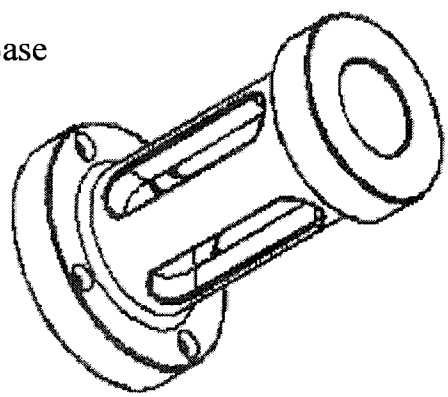

FIGURE S2

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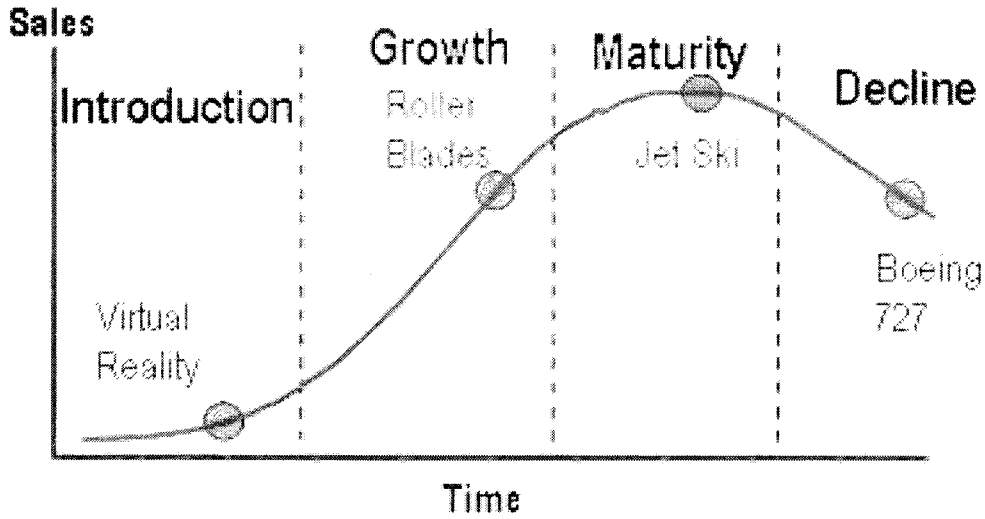
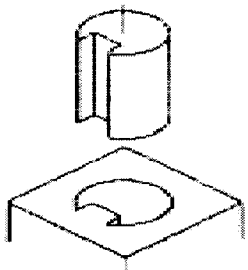
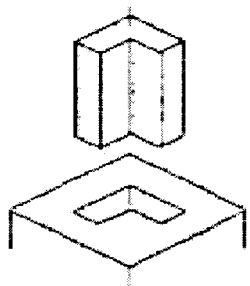


FIGURE S3



S3 (i)



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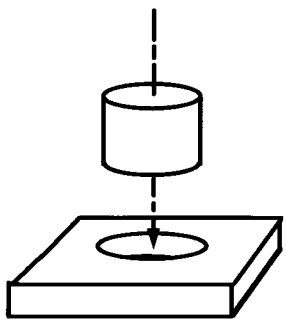
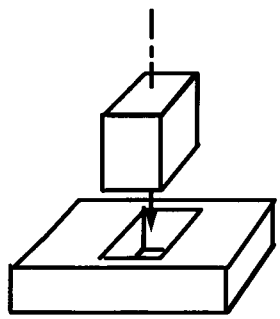
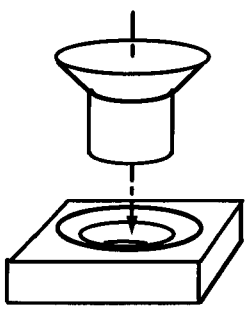


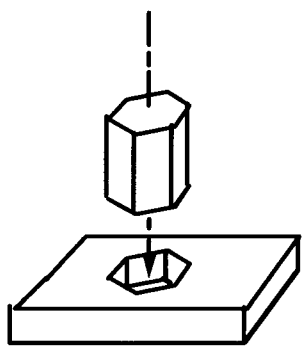
S3 (iii)



S3 (iv)



S3 (v)



S3 (vi)

FIGURE S4

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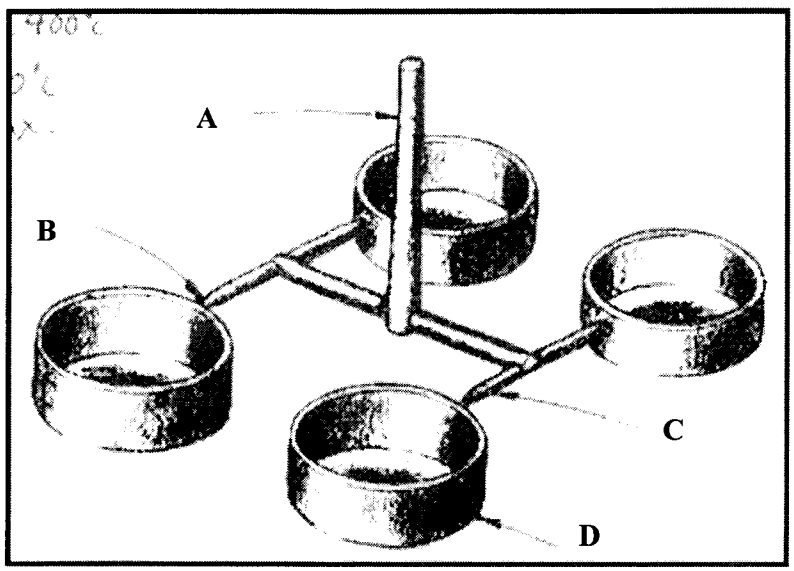

FIGURE S5

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BDI - DFA Manual Handling & Insertion Chart

MANUAL HANDLING—ESTIMATED TIMES (seconds)

Key:
- ONE HAND
- ONE HAND with GRASPING AIDS
- TWO HANDS for MANIPULATION
- TWO HANDS required for LARGE SIZE

			parts are easy to grasp and manipulate					parts present handling difficulties (1)				
			thickness > 2 mm			thickness ≤ 2 mm		thickness > 2 mm			thickness ≤ 2 mm	
			size >15 mm	6 mm ≤ size ≤15 mm	size <6 mm	size >6 mm	size ≤6 mm	size >15 mm	6 mm ≤ size ≤15 mm	size <6 mm	size >6 mm	size ≤6 mm
			0	1	2	3	4	5	6	7	8	9
parts can be grasped and manipulated by one hand without the aid of grasping tools	$(\alpha+\beta) < 360°$	0	1.13	1.43	1.88	1.69	2.18	1.84	2.17	2.65	2.45	2.98
	$360° \le (\alpha+\beta) < 540°$	1	1.5	1.8	2.25	2.06	2.55	2.25	2.57	3.06	3	3.38
	$540° \le (\alpha+\beta) < 720°$	2	1.8	2.1	2.55	2.36	2.85	2.57	2.9	3.38	3.18	3.7
	$(\alpha+\beta) = 720°$	3	1.95	2.25	2.7	2.51	3	2.73	3.06	3.55	3.34	4

			parts need tweezers for grasping and manipulation								parts need standard tools other than tweezers	parts need special tools for grasping and manipulation
			parts can be manipulated without optical magnification				parts require optical magnification for manipulation					
			parts are easy to grasp and manipulate		parts present handling difficulties (1)		parts are easy to grasp and manipulate		parts present handling difficulties (1)			
			thickness > 0.25 mm	thickness ≤ 0.25 mm	thickness > 0.25 mm	thickness ≤ 0.25 mm	thickness > 0.25 mm	thickness ≤ 0.25 mm	thickness > 0.25 mm	thickness ≤ 0.25 mm		
			0	1	2	3	4	5	6	7	8	9
parts can be grasped and manipulated by one hand but only with the use of grasping tools	$\alpha \le 180°$	$0 \le \beta \le 180°$	4	7.25	4.75	8	6	8.75	6.75	9	8	8
		$\beta = 360°$	3.6	6.85	4.35	7.6	5.6	8.35	6.35	8.6	7	7
	$\alpha = 360°$	$0 \le \beta \le 180°$	4.8	8.05	5.55	8.8	6.8	9.55	7.55	9.8	8	9
		$\beta = 360°$	5.1	8.35	5.85	9.1	7.1	9.55	7.85	10.1	9	10

			parts present no additional handling difficulties					parts present additional handling difficulties (e.g. sticky, delicate, slippery, etc.) (1)				
			$\alpha \le 180°$			$\alpha = 360°$		$\alpha \le 180°$			$\alpha = 360°$	
			size > 15 mm	6 mm ≤ size ≤ 15 mm	size < 6 mm	size > 6 mm	size ≤ 6 mm	size > 15 mm	6 mm ≤ size ≤ 15 mm	size < 6 mm	size > 6 mm	size ≤ 6 mm
			0	1	2	3	4	5	6	7	8	9
parts severely nest or tangle or are flexible but can be grasped and lifted by one hand (with the use of grasping tools if necessary) (2)		8	4.1	4.5	5.1	5.6	6.75	5	5.25	5.85	6.35	7

			parts can be handled by one person without mechanical assistance									
			parts do not severely nest or tangle and are not flexible								parts severely nest or tangle or are flexible (2)	parts need special tools for grasping and manipulation
			part weight < 10 lb				parts are heavy (> 10 lb)					
			parts are easy to grasp and manipulate		parts present other handling difficulties (1)		parts are easy to grasp and manipulate		parts present other handling difficulties (1)			
			$\alpha \le 180°$	$\alpha = 360°$	$\alpha \le 180°$	$\alpha = 360°$	$\alpha \le 180°$	$\alpha = 360°$	$\alpha \le 180°$	$\alpha = 360°$		
			0	1	2	3	4	5	6	7	8	9
two hands required for grasping and transporting parts		9	2	3	2	3	3	4	4	5	7	9

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BDI - DFA Manual Handling & Insertion Chart

MANUAL INSERTION—ESTIMATED TIMES (seconds)

Key:
- PART ADDED but NOT SECURED
- PART SECURED IMMEDIATELY
- SEPARATE OPERATION

addition of any part (1) where neither the part itself nor any other part is finally secured immediately				after assembly no holding down required to maintain orientation and location (3)				holding down required during subsequent processes to maintain orientation or location (3)			
				easy to align and position during assembly (4)		not easy to align or position during assembly		easy to align and position during assembly (4)		not easy to align or position during assembly	
				no resistance to insertion	resistance to insertion (5)	no resistance to insertion	resistance to insertion (5)	no resistance to insertion	resistance to insertion (5)	no resistance to insertion	resistance to insertion (5)
				0	1	2	3	6	7	8	9
part and associated tool (including hands) can easily reach the desired location			0	1.5	2.5	2.5	3.5	5.5	6.5	6.5	7.5
part and associated tool (including hands) cannot easily reach the desired location	due to obstructed access or restricted vision (2)		1	4	5	5	6	8	9	9	10
	due to obstructed access and restricted vision (2)		2	5.5	6.5	6.5	7.5	9.5	10.5	10.5	11.5

addition of any part (1) where the part itself and/or other parts are being finally secured immediately				no screwing operation or plastic deformation immediately after insertion (snap/press fits, circlips, spire nuts, etc.)		plastic deformation immediately after insertion						screw tightening immediately after insertion (6)	
						plastic bending or torsion			rivetting or similar operation				
				easy to align and position with no resistance to insertion (4)	not easy to align or position during assembly and/or resistance to insertion (5)	easy to align and position during assembly (4)	not easy to align or position during assembly		easy to align and position during assembly (4)	not easy to align or position during assembly		easy to align and position with no torsional resistance (4)	not easy to align or position and/or torsional resistance (5)
							no resistance to insertion	resistance to insertion (5)		no resistance to insertion	resistance to insertion (5)		
				0	1	2	3	4	5	6	7	8	9
part and associated tool (including hands) can easily reach the desired location and the tool can be operated easily			3	2	5	4	5	6	7	8	9	6	8
part and associated tool (including hands) cannot easily reach desired location or tool cannot be operated easily	due to obstructed access or restricted vision (2)		4	4.5	7.5	6.5	7.5	8.5	9.5	10.5	11.5	8.5	10.5
	due to obstructed access and restricted vision (2)		5	6	9	8	9	10	11	12	13	10	12

assembly processes where all solid parts are in place				mechanical fastening processes (part(s) already in place but not secured immediately after insertion)				non-mechanical fastening processes (part(s) already in place but not secured immediately after insertion)				non-fastening processes	
				none or localized plastic deformation				metallurgical processes					
				bending or similar processes	rivetting or similar processes	screw tightening (6) or other processes	snap fit, snap clip, press fit, etc.	no additional material required (e.g. resistance, friction welding, etc.)	additional material required		chemical processes (e.g. adhesive bonding, etc.)	manipulation of parts or sub-assembly (e.g. orienting, fitting or adjustment of part(s) etc.)	other processes (e.g. liquid insertion, etc.)
									soldering processes	weld/braze processes			
				0	1	2	3	4	5	6	7	8	9
			9	4	7	5	3.5	7	8	12	12	9	12