UNIVERSITI TUN HUSSEIN ONN MALAYSIA

PEPERIKSAAN AKHIR
SEMESTER II
SESI 2009/2010

NAMA MATA PELAJARAN	: REKABENTUK UNTUK PEMBUATAN DAN PEMASANGAN
KOD MATA PELAJARAN	: BDD 4013
KURSUS	: 4 BDP
TARIKH PEPERIKSAAN	: APRIL/MEI 2010
JANGKA MASA	: 2 JAM 30 MINIT
ARAHAN	: BAHAGIAN A: JAWAB **SEMUA** SOALAN **DI ATAS KERTAS SOALAN INI**. BAHAGIAN B: JAWAB **TIGA (3) SOALAN SAHAJA** DARIPADA EMPAT (4) SOALAN YANG DIPERUNTUKKAN **DI ATAS BUKU JAWAPAN** YANG DISEDIAKAN.

KERTAS SOALAN INI MENGANDUNGI SEMBILAN (9) MUKASURAT BERCETAK

PART A: Answer **ALL questions** for this part in this paper.

Q1. What is the meaning of Design For Assembly (DFA) and list down **TWO (2)** main factors that influences the assembly costs for a product or subassembly?

(6 marks)

Q2. What are the characteristics of successful product development? (5 marks)

Q3. If the average assembly time (handling and insertion) for a part was used with the minimum number of part is equal to 5 and the efficiency of manual assembly design is 0.07, calculate the total time to assemble that part.

(3 marks)

Q4. The acceptance of a minimum part calculation theory is the most effective method to identify the simplicity of a product structure. What are the **THREE (3)** main principles to segregate parts in a product?

(6 marks)

Q5. Refer to **Figure 1**, discuss the importance of design phase. (5 marks)

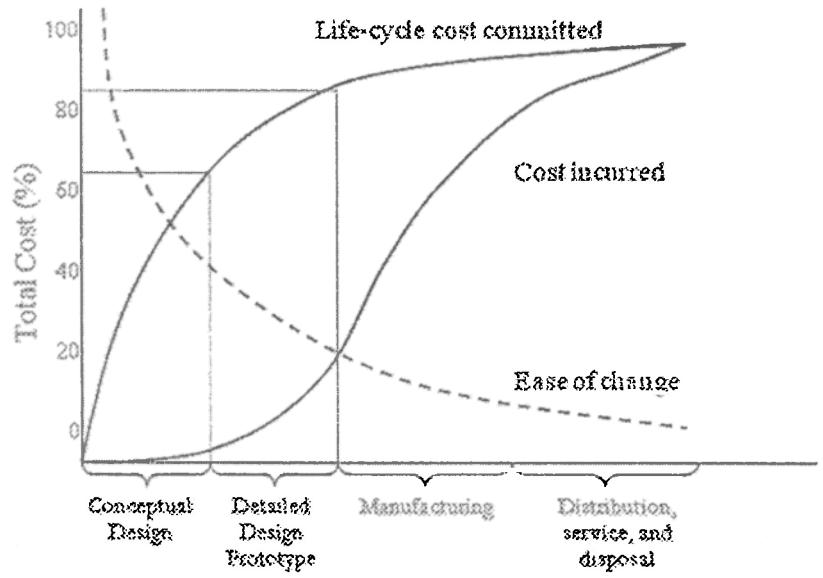

Figure 1: Design stage vs total cost

Q6 Machining is refers to cutting operations that are based on the removal of material from a rough-shaped workpiece for example turning, milling etc. Define the terms below in turning operation;

(6 marks)

i) Cutting velocity, *V*: _____

_____

ii) Material removal rate, *MRR*: _____

_____

iii) Machining time, t_m: _____

_____

Q7 There are three important surfaces of the work piece in machining operation. Describe briefly, **TWO (2)** important surfaces of the work piece;

(3 marks)

i) Machined surface – _____

_____

ii) Transient surface – _____

_____

Q8 There are three typical runner layouts in injection molding. Explain briefly **ONE (1)** advantage and disadvantage of these runner layouts;

(6 marks)

Types of runner layouts	Advantage	Disadvantage
i) Circular		
ii) Series		
iii) Symmetrical		

PART B: Please answer **THREE (3) questions ONLY** for this part at answering book sheet.

Q9 (a) Based on the **Table 1** below, determine;

(i) The assembly cost if the worker's manual assembly rate is RM10 per hour.
(ii) The percentage of part reduction.
(iii) The effectiveness of assembly for the new design.

Table 1

No.	Description	Old Design	New Design
1	Quantity	47	26
2	Total assembly time	6.37 min	2.58 min
3	Number of minimum part in theoritical	7	7

(6 marks)

(b) A product will go through its life cycle; introduction, growth, maturity and decline as shown in **Figure 2**. Discuss what happen to the product during the growth ,maturity and decline phase.

(14 marks)

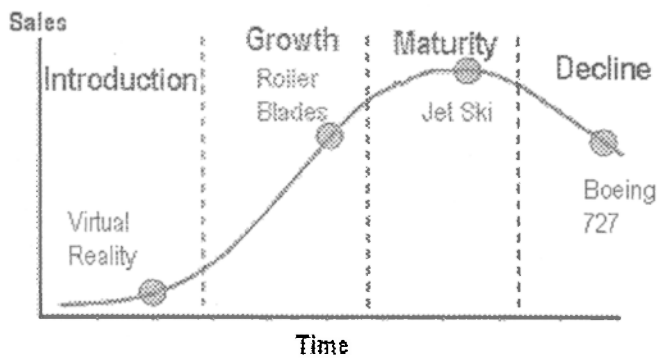

Figure 2 : Product life cycle

Q10 (a) There are **TWO (2)** disadvantages if using blanking die in producing the parts in metal forming. State these disadvantages and explain briefly why it could be happen?

(6 marks)

(b) **Figure 3** shows the rectangular shape of sheet metal with size 150mm x 90mm that surround with nine holes. The perimeter of each non-standard shape for hole "**T**" and hole "C" is 80mm and 96mm respectively. By assuming that 50mm space was allowed at surrounding area of part at the die set and the die manufacture rate is RM35 per hour. Determine the cost of piercing die for drilling these nine holes?

(14 marks)

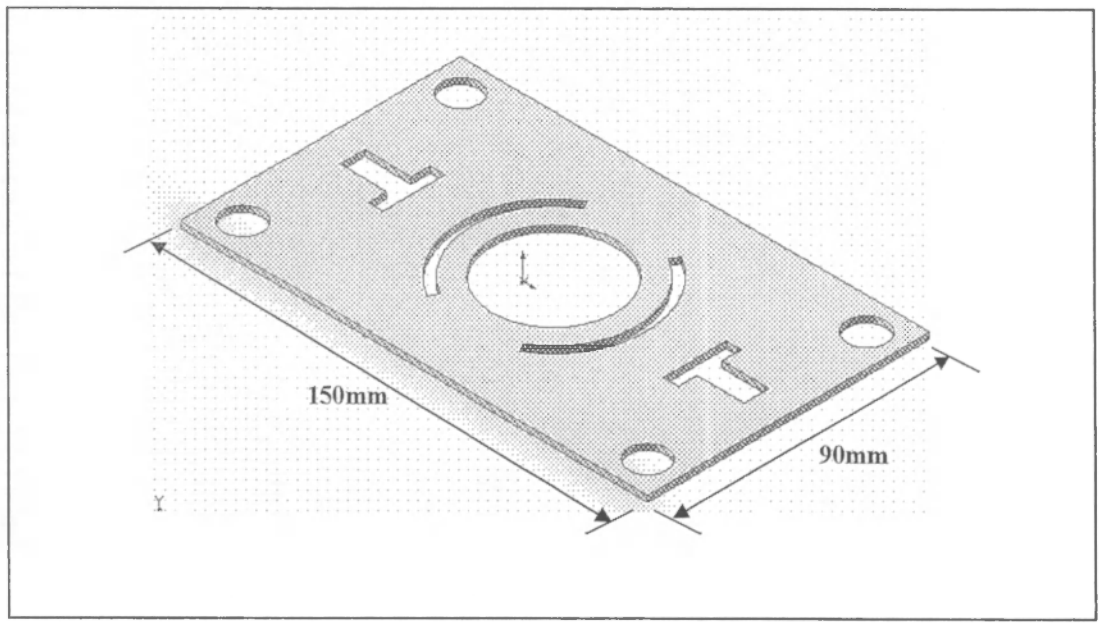

Figure 3

Q11 (a) Good injection molded part design relies on consistent wall thickness to minimize the potential for warped or distorted parts. By using appropriate figures, explain briefly how the warp and sink happen and how can you avoid it in part design?

(8 marks)

(b) A batch of 15 mm diameter disks with a thickness of 30 mm is to be molded from **Acetal** in a mold. The arrangement of the disk during molding is shown in **Figure 4.** Assume the percentage increase for the runner system is 50% and the clearance is 7.5 cm. By using **Table 1 and 2** provided;

(12 marks)

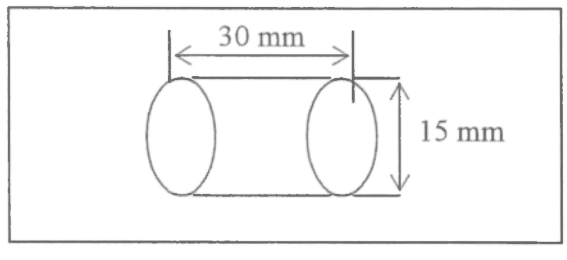

Figure 4

(i) Determine the appropriate size of the plastic injection molding machine
(ii) Determine the cycle time
(iii) Determine the mold base cost
(iv) Determine the optimum number of cavities if 50,000 of disks are needed. Assume k_1 = \$25/hour and m = 0.7

Q12 (a) Explain briefly **FOUR (4)** of the design guidelines in machining operation?

(8 marks)

(b) A gun drilling operation is used to drill a 9/64 in. diameter hole to a certain depth. It takes 4.5 min to perform the drill operation using high pressure fluid delivery of coolant to the drill point. The cutting conditions include a spindle speed of 4000 rev/min at a feed of 0.0017 in/rev. In order to improve the surface finish in the hole, it has been decided to increase the speed by 20% and decrease the feed by 25%. How long will take to perform the operation at the new cutting conditions?

(12 marks)

Lampiran I

PEPERIKSAAN AKHIR

SEMESTER/SESI : SEMESTER 2/2009/10 KURSUS : 4BDP
MATA PELAJARAN : REKABENTUK UNTUK PEMBUATAN DAN PEMASANGAN KOD MATA PELAJARAN: BDD 4013

Table 1 – Injection Molding Machine

Clamping force (kN)	Shot size (cc)	Operating cost ($/h)	Dry cycle times (s)	Maximum clamp stroke (cm)	Driving power (kW)
300	34	28	1.7	20	5.5
500	85	30	1.9	23	7.5
800	201	33	3.3	32	18.5
1100	286	36	3.9	37	22.0
1600	286	41	3.6	42	22.0
5000	2290	74	6.1	70	63.0
8500	3636	108	8.6	85	90.0

Table 2 – The Processes Data for Selected Polymer

Thermoplastic	Specific gravity	Thermal diffusivity (mm²/s)	Injection temp. (°C)	Mold temp (°C)	Ejection temp. (°C)	Injection pressure (bars)
High-density polyethylene	0.95	0.11	232	27	52	965
High-impact polystyrene	1.59	0.09	218	27	77	963
Acrylonitrile-butadiene-styrene (ABS)	1.05	0.13	260	54	82	1000
Acetal (homopolymer)	1.42	0.09	216	93	129	1102
Polyamide (6/6 nylon)	1.13	0.10	291	91	129	1103
Polycarbonate	1.20	0.13	302	91	127	1172
Polycarbonate (30% glass)	1.43	0.13	329	102	141	1310
Modified polyphenylene oxide (PPO)	1.06	0.12	232	82	102	1034
Modified PPO (30% glass)	1.27	0.14	232	91	121	1034
Polypropylene (40% talc)	1.22	0.08	218	38	88	965
Polyester terephthalate (30% glass)	1.56	0.17	293	104	143	1172

Lampiran II

PEPERIKSAAN AKHIR

SEMESTER/SESI : SEMESTER 2/2009/10 KURSUS : 4BDP
MATA PELAJARAN : REKABENTUK UNTUK PEMBUATAN DAN PEMASANGAN KOD MATA PELAJARAN: BDD 4013

List of Formula:

$$EM = \frac{3 \times NM}{TM}$$

$$C_{ds} = 120 + 0.36A_{si}$$

$$t_m = \frac{d_m}{2fn_w}$$

$$X_p = \frac{P^2}{LW}$$

$$v_{\max} = \pi n_w d_m$$

$$M_p = M_{po} f_{hw} f_d$$

$$Z_{n_{\max}} = \pi f a_p n_w d_m$$

$$\text{Total Die Cost} = C_{ds} + \left(M_{po} + M_{pc} + M_{ps}\right)R$$

F (kN) = A (m^2) x P_{max} (kN/m^2)

$$M_{po} = 23 + 0.03LW$$

$$M_{pc} = 8 + 0.6P + 3N_p$$

$$M_{ps} = KN_p + 0.4N_a$$

$$t_f = \frac{V}{Q_{av}} = \frac{2V_s p_j}{P_j}$$

$$n = \left(\frac{N_t k_1 t}{(mC_{c1})}\right)^{1/(m+1)}$$

$$t_c = \frac{h^2_{\max}}{\pi^2 \alpha} \log_e \frac{4(T_i - T_{in})}{\pi(T_x - T_m)} x\, C$$

$$t_r = 1 + 1.75t_s\left[\frac{2D+5}{L_s}\right]^{1/2}$$

$$t_{close} = 0.5t_s\left[\frac{2D+5}{L_s}\right]^{1/2}$$

$$C_b = 1000 + 0.45A_c h_p^{\,0.4}$$

$$t_f = \frac{V}{Q_{av}} = \frac{2V_s p_j}{P_j}$$

$$t_{close} = 0.5t_d\left[\frac{2D+5}{L_s}\right]^{1/2}$$