



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020**

COURSE NAME : PRODUCT DESIGN AND DEVELOPMENT
COURSE CODE : BNM 31003
PROGRAMME CODE : BNM
EXAMINATION DATE : DECEMBER 2019 / JANUARY 2020
DURATION : 2 HOURS 30 MINUTES
INSTRUCTION : ANSWERS ALL QUESTIONS

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THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

- Q1** (a) List **FIVE (5)** characteristics of successful product development. (5 marks)
- (b) A product development organization is the scheme by which individual designers and developers are linked together into groups. Organizational links may be aligned with functions, projects, or both. Compare with explanation and diagram between:
- (i) Functional organization (3 marks)
 - (ii) Project organizations; and (3 marks)
 - (iii) Matrix organizations (Lightweight and Heavyweight) (6 marks)
- (c) In an iterative fashion, the team converges on the specifications that will most favorably position the product relative to the competition, will best satisfy the customer needs, and will ensure adequate profits. One important tool for supporting this decision-making process is the competitive map. Illustrate briefly the competitive map shown in **Figure Q1 (c)**. (8 marks)
- Q2** (a) Development team of your company has generated seven concepts of outpatient syringe. Several criteria has also been identified. In order to narrow the number of concepts quickly and concepts improvement, Concepts-screening matrix has been prepared as **Table Q2 (a)**. Analyze the ranking of each concept and categorize which concept should be continued, dropped, combined or revised. (10 marks)
- (b) Concept scoring is used when increased resolution will better differentiate among competing concepts. In this stage, the team weighs the relative importance of the selection criteria and focuses on more refined comparisons with respect to each criterion. Concepts-scoring matrix has been prepared as **Table Q2 (b)**. Select the best concept among the four screened concepts. (10 marks)
- (c) The sample size of the survey should be large enough that the team's confidence in the results is high enough to guide decision making. Compare the factors leading to relatively smaller or larger survey sample sizes. (5 marks)

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- Q3** (a) List out factors that influence the selection of process to produce a part. (6 marks)
- (b) Design for Manufacturing (DFM) guidelines are statements of good design practice that have been empirically derived from years of experience. Using these guidelines helps narrow the range of possibilities so that the mass of detail that must be considered is within the capability of the designer. Arrange the guidelines of DFM. (10 marks)
- (c) **Table Q3 (c)** shows the results of the Design for Assembly (DFA) analysis of the initial design and improve design. Hourly cost of assembly is \$30/hour.
- (i) Differentiate the design efficiency for assembly before and after redesign. Fill the required data in the **Table Q3 (c)** and shows your calculations. (3 marks)
- (ii) Differentiate the cost of assembly in Dollar (\$) currency before and after redesign. Fill the required data in the **Table Q3 (c)** and shows your calculations. (3 marks)
- (iii) Analyze how DFA analysis contribute to the Motor-drive assembly process. (3 marks)
- Q4** (a) Careful attention to the following design issues of human sensory will create user-friendly designs. Classify with explanation and example the principles of user-friendly design. (12 marks)
- (b) A hazard is the potential for human, property, or environmental damage. Categorize **SIX (6)** of societal hazard classifications by giving examples. (6 marks)
- (b) The General Electric Co. has identified a major market in environmental and energy-related businesses. In early 2005 it announced that it hopes to double its revenues in environmental products to \$20 billion by 2010 from creating and selling products that are based on technologies that are environmentally cleaner. These include wind turbines, solar energy, clean coal gasification, and improved water treatment systems. Construct the flow chart of the Design for Environment (DFE) process. (7 marks)

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-END OF QUESTIONS-

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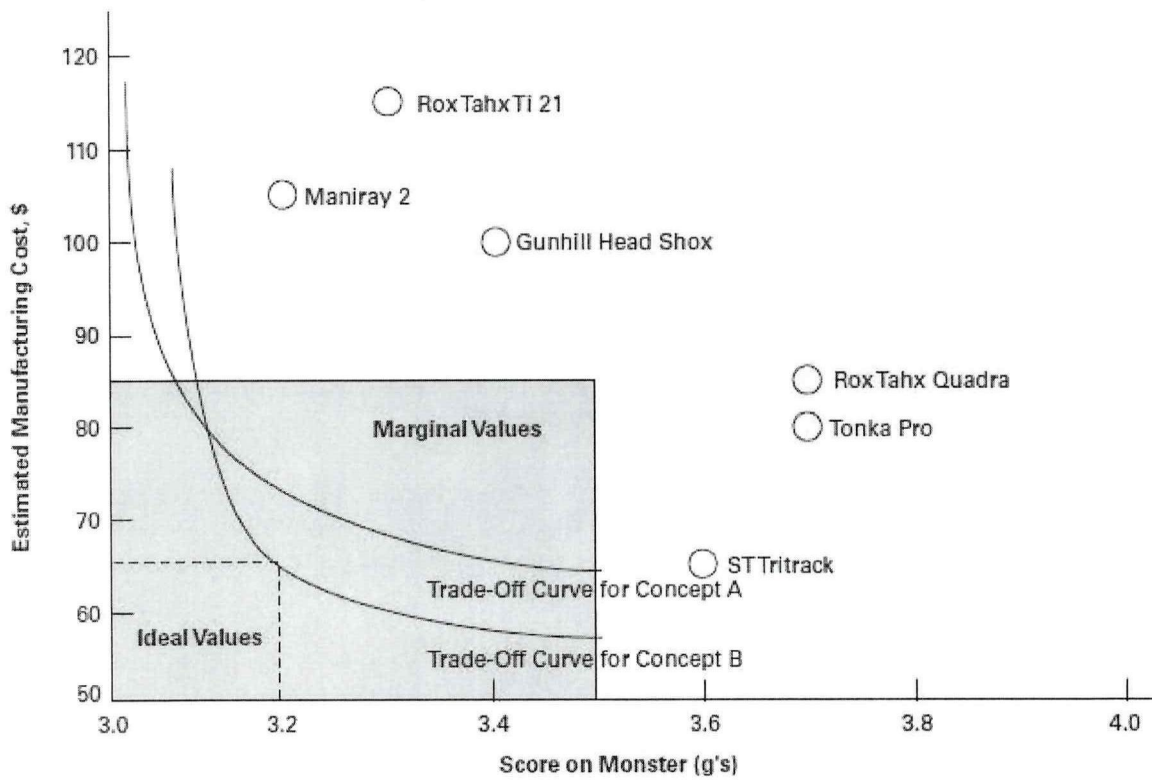


EXHIBIT 6-11 A competitive map showing estimated manufacturing cost versus score on the Monster test. Trade-off curves for two suspension concepts are also drawn on this map.

Figure Q1 (c)

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Table Q2 (a)

Selection Matrix	Concepts						
	A	B	C	D	E	F	G
Ease of handling	0	0	-	0	0	-	-
Ease of Use	0	-	-	0	0	+	0
Readability of settings	0	0	+	0	+	0	+
Dose metering accuracy	0	0	0	0	-	0	0
Durability	0	0	0	0	0	+	0
Ease of Manufacture	+	-	-	0	0	-	0
Portability	+	+	0	0	+	0	0

Table Q2 (b)

Selection Matrix	Weightage (%)	Concepts			
		Continue 1 (Reference)	Combine	Continue 2	Revise
		Rating			
Ease of handling	5	3	3	4	4
Ease of Use	15	3	4	4	3
Readability of settings	10	2	3	5	5
Dose metering accuracy	25	3	3	2	3
Durability	15	2	5	4	3
Ease of Manufacture	20	3	3	2	2
Portability	10	3	3	3	3

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Table Q3 (c)

Results of DFA Analysis for the Motor-Drive Assembly (Initial Design)				
Part	No.	Theoretical Part Count	Assembly Time, s	*Assembly Cost, ¢
Base	1	1	3.5	
Bushing	2	0	12.3	
Motor subassembly	1	1	9.5	
Motor screw	2	0	21.0	
Sensor subassembly	1	1	8.5	
Setscrew	1	0	10.6	
Stand-off	2	0	16.0	
End plate	1	1	8.4	
End-plate screw	2	0	16.6	
Plastic bushing	1	0	3.5	
Thread leads	5	
Reorient	4.5	
Cover	1	0	9.4	
Cover screw	4	0	31.2	
*Total				
*Efficiency (%)				
Results of DFA Analysis for the Motor-Drive Assembly (After Redesign)				
Part	No	Theoretical Part Count	Assembly Time, s	*Assembly Cost, ¢
Base	1	1	3.5	
Motor subassembly	1	1	4.5	
Motor screw	2	0	12.0	
Sensor subassembly	1	1	8.5	
Setscrew	1	0	8.5	
Thread leads	5.0	
Plastic Cover	1	1	4.0	
*Total				
*Efficiency (%)				

* Fill in the answer. Attached Table Q3 (c) together with the answer script.