

## National Exams May 2012

### 07-Mec-B5, Product Design & Development

THREE (3) hours duration

#### **NOTES:**

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.
2. This is an OPEN BOOK EXAM. No calculator is permitted.
3. Question ONE (1) must be completed and is worth 40%, choose Four (4) out of the SIX (6) remaining questions each worth 15% for a total of 100%.
4. The first FIVE (5) questions as they appear in the answer book will be marked.
5. Most questions require an answer in essay format or the use of tables, figures and charts. Clarity and organization of the answer are important.

**QUESTION 1 MUST BE COMPLETED.**

Question (1) (40 Marks)

Select ONE (1) of the following THREE (3) products and use it to demonstrate your understanding of the design process.

- i. Household Toaster
- ii. Sport Water Bottle
- iii. Luggage

\*Suggestion: This is meant to be an open ended question where the process is more important than the actual design so develop a design direction and consistently follow it through to completion.

- A. Outline the process you would go through to establish the design specifications for the product you have selected.
- B. Apply your process to generate a set of realistic specifications for your product.
- C. Using simple sketches show THREE (3) different general design concepts which address the design requirements you outlined in B.
- D. Outline a methodology that could be applied to compare the design alternatives.
- E. Apply your methodology to rank your design ideas and select one design as the best one.
- F. Provide a high level summary of the next steps associated with full commercialization.

**CHOOSE FOUR (4) OUT OF THE SIX (6) REMAINING QUESTIONS.**

**Question (2) (15 Marks)**

- A. Provide a definition for Universal Design.
- B. Apply principles of Universal Design to design a front door handle for a typical house. Be sure to include all of the functional aspects typically present in this location.
- C. Outline TWO (2) reasons Universal Design is not always used when designing a new product.

**Question (3) (15 Marks)**

- A. As a socially responsible designer list your top THREE (3) overarching design objectives that you work to include in all of your designs.
- B. Discuss how these would impact your design for a new chair.
- C. Outline a method of assessing success for each of your THREE (3) design objectives from part A.

**Question (4) (15 Marks)**

- A. Outline how design impacts manufacturing as well as part cost and availability.
- B. What engineering approach can be applied to improve the manufacturability of a design?
- C. Discuss how a change in material at the design stage can impact the manufacturing process.

**Question (5) (15 Marks)**

- A. Discuss the FIVE (5) phases that a product design goes through.
- B. Apply a stage gate process to your product design process by identifying and describing an appropriate hurdle that a design needs to achieve for each of the FIVE (5) phases identified in part A.

**Question (6) (15 Marks)**

- A. Describe THREE (3) methods of protecting a new design idea.
- B. Provide an example of where each is best applied with your reasoning.
- C. Outline why the inventor of the pet rock (painted rock with eyes and other animated features) was never able to fully profit from his idea yet Bill Gates was able to profit substantially from his computer operating system.

**Question (7) (15 Marks)**

- A. Describe what is meant by concurrent design.
- B. How would you apply it to the design of a product like a car?
- C. What benefits would you expect to realize by practicing concurrent design?