

## National Exams May 2010

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.  
Any non-communicating calculator is permitted.
3. FIVE (5) out of the SEVEN (7) questions constitute a complete exam paper.

The first FIVE (5) questions as they appear in the answer book will be marked.

4. Each question is of equal value.
5. Most questions require an answer in essay format. Clarity and organization of the answer are important.

Question (1) (20 Marks)

- A. Provide a functional definition of engineering design.
- B. Compare and contrast the role of a scientist, engineer and technician working on a design team developing a new hand held mobile phone product.
- C. What other technical and professional backgrounds are beneficial to complete a team tasked with the rapid product development of the hand held mobile phone product discussed in part B.

Question (2) (20 Marks)

- A. Outline the process an inventor would go through to patent a product.
- B. What rights does a patent give an inventor?
- C. Is patenting always the best option for an inventor? Explain your answer using an example.
- D. Provide 4 other options an inventor has to protect their intellectual property.

Question (3) (20 Marks)

- A. What is design for manufacturing and assembly (DFMA)?
- B. Describe the steps one would take to implement DFMA in a design process.
- C. Outline the advantages of using DFMA.
- D. What impact does the use of DFMA have on the cost structure of a project from the idea stage right through to full scale mass production?
- E. Outline what factors need to be considered when deciding between manual and automated assembly.
- F. Describe the steps that can be taken to ensure total life cycle costs are considered when designing a product.

Question (4) (20 Marks)

- A. Outline and discuss FIVE (5) steps commonly taken during the design process.
- B. Describe how the decision making process interacts with the design process to refine a design?
- C. Describe THREE (3) different ways a company can compare alternate design solutions.

Question (5) (20 Marks)

- A. List FOUR (4) options for joining two pieces of material together in a system.
- B. What factors are important when choosing a joining process?
- C. Develop the framework of a simple selection guide that could be used by a new designer to select the best joining technique for an application.

Question (6) (20 Marks)

- A. Describe THREE (3) different ways in which new product ideas can be generated.
- B. Outline FOUR (4) methods of communicating product design information.
- C. Describe how an iterative design process can be applied to improve on a design.
- D. What are some of the issues associated with getting final consumers involved in the design process?

Question (7) (20 Marks)

- A. Consider a simple kitchen countertop toaster. Discuss the design changes that have taken place since they were first widely available for home use in 1909. Be sure to focus on how innovations in materials, sensors and controls have impacted design.
- B. Where in the product life cycle is this product?
- C. If you were a design specialist in a toaster manufacturing company where would you focus your current design efforts?