



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 3 Examination in Engineering: August 2015

Module Number: ME3111

Module Name: Engineering Design Methodology

[Two Hours]

[Answer all questions. All questions carry equal marks]

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- Q1. a) What is Engineering Design? [1.5 Marks]
- b) Briefly explain the importance of studying the Engineering Design Process. [3.5 Marks]
- c) Explain the following terms giving suitable examples. [5.0 Marks]
- I. Adaptive Design
 - II. Variant Design
 - III. Innovative Design
 - IV. Selection Design
- Q2. a) Figure Q2 shows the design model developed by French, 1999. Discuss its suitability or unsuitability for the design project that you conducted as a group under this module ME3111. [3.0 Marks]
- b) State six design methods for specifying a product. [2.4 Marks]
- c) Explain three design methods for specifying a product with suitable examples. [4.6 Marks]
- Q3. a) I. What is "creativity"?
II. Briefly explain the barriers to creativity. [4.0 Marks]
- b) The paragraph below explains a typical "Brainstorming" session conducted on lady bicycles. Read the paragraph and briefly explain the changes/improvements you suggest for a successful brainstorming session.
- This is a brainstorming session conducted by ABC Company *to generate ideas for suggesting extra functions and performance for lady bicycles*. Twenty workers participated in the session. This includes 6 design engineers, 5 plant mechanical engineers, 4 electrical engineers, the factory manager and 4 managers in following departments; design, quality, maintenance and production. The factory manager explains the necessity of expanding the factory and launching new products and asked each ones suggestions on extra functions and performance for lady bicycles. Four managers express their suggestions and one voluntary engineer started writing the ideas on a white board. All engineers expressed their ideas during their turn. 22 suggestions were recorded during 1 hour and 15 minutes period. [6.0 Marks]

Q4. a) Explain the Pugh's decision matrix method for concept evaluation.

[4.0 Marks]

b) Table Q4 shows the Morphological chart developed for evaluating three alternative designs for a coffee maker. Considering minimum energy as the main criteria, develop weighted decision matrix and evaluate the three designs.

[6.0 Marks]

Table Q4 Morphological chart for the coffee maker

Functions	Possible Conceptual Solutions			Impact consequences (positive/negative)
Receive coffee material	Automatic receive	Manual receive		More energy needed
Mix hot water and powder	Filter	Osmosis		Time increases then energy increases
Filter out coffee powder	Paper filter	Steel mesh filter	Plastic filter	High impact/less impact
Distribute electricity	cord			Electrical shock(insulation required)
Heat water	Submersible element	Large heating plate		More energy consumption
Keep Warm	Hot plate	Insulated cup		Energy consumption kept
Dissipate heat	Temp. insulation	Steel covers		Energy kept

Design Concept 1	Design Concept 2	Design Concept 3
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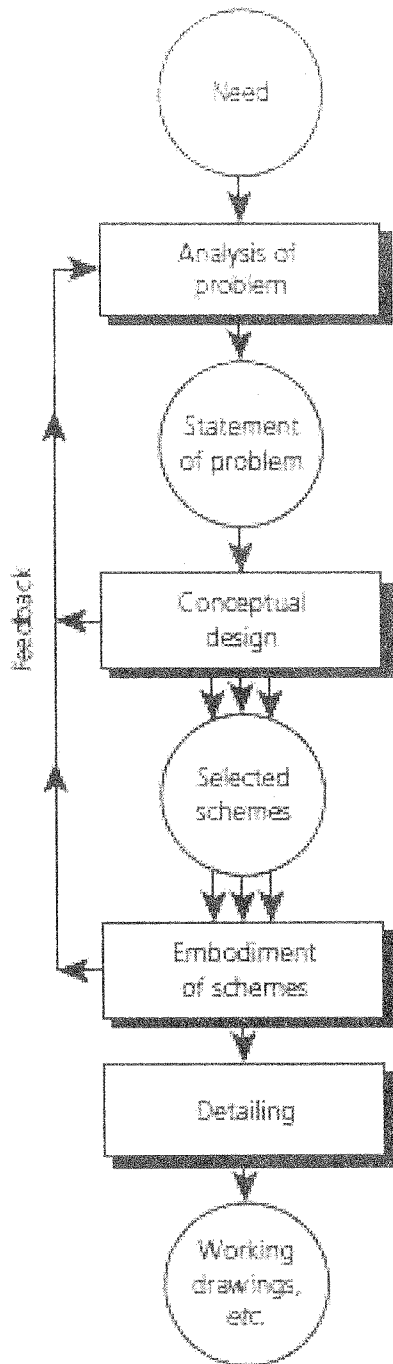


Figure Q2