THE OPEN UNIVERSITY OF SRI LANKA

FACULTY OF ENGINEERING TECHNOLOGY

DIPLOMA IN TECHNOLOGY - LEVEL 03

FINAL EXAMINATION – 2011/12

MEX3174 – PRINCIPLES OF DESIGN

MEX2132 – DESIGN PHILOSOPHY

DATE : ***MARCH 22, 2012***
TIME : ***1400 HRS. – 1700 HRS.***
DURATION : ***THREE HOURS***

ANSWER ANY FIVE (05) QUESTIONS. ALL QUESTIONS CARRY EQUAL MARKS.

Question 01

'From the invention of simple potter's wheel through evolution of complex engineering artifacts to modern transportation systems, etc., humans have been successfully designing for nearly 5000 years.'

Do you agree with this statement? Briefly justify your answer using appropriate examples.

If humans have been designing for 5000 years as explained above and there are literally millions of artifacts that worked and worked well, explain clearly, then why it is still necessary to study the design process

Question 02

a. Given below are several phases of engineering design. They are not arranged in the proper sequence. Arrange these phases in sequential manner and draw a suitable flow chart incorporating these phases that complete the engineering design process.

Evaluation
Synthesis
Definition of the Problem
Presentation
Recognition of need
Analysis and optimization

Also indicate clearly the activities to be conducted in **analysis and optimization** phase.

b. Why is it essential to have **feed-back paths** (iterative loops) in a design exercise? Illustrate your answer using simple design model (only illustrate the required part of the model).

c. Explain the term **Design for Sustainability**. Your answer should address at least <u>two</u> concepts of sustainability.

Question 03

a. *Design for safety means ensuring that the product will not cause any damage or injury to the others.* ***Designing and incorporation of safety features into the product and alarm systems to draw the attention of the operator or others in the vicinity*** *are two main ways to institute safety of an engineering product.*

With the help of a suitable example clearly explain the safety features incorporated in products with particular reference to the above statement.

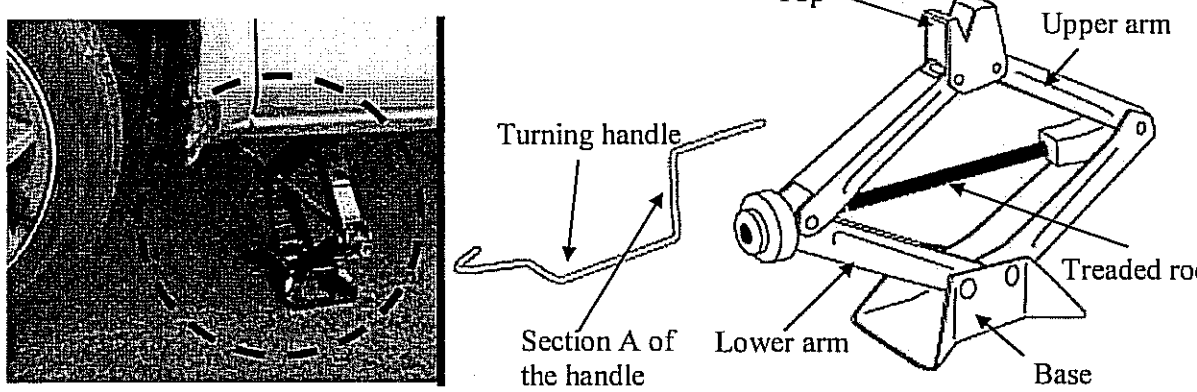
b. Efficient communication is essential to carry out modern designing and manufacturing. Explain the need to have reliable communication methods in modern manufacturing facility and also briefly discuss the usage of drawings in communicating and evaluating a design.

Question 04

Assume that you are the leader of a design team, which has been given a task of designing a lifting jack for a car.

i. State two (02) objectives that needed to be fulfilled by the design and also state three (03) questions you would ask from car users to clarify the design objectives.

ii. Figure.Q4 shows actual picture and an illustration of a proposed car jack.



(a) Car jack in use. (b) Sketch of the jack.

Figure.Q4

a. Briefly discuss the working principle of the proposed jack, clearly stating how it lifts the car.

b. Discuss the importance of the **section A** of the handle shown in Figure.Q4(b).

c. Discuss two design requirements that the base of the jack should fulfill.

Question 05

a. *The professional designers say that the modern design is a group effort.*
Assuming the above statement is correct, select an appropriate engineering product and clearly state the different kind of specialized groups involved in designing and manufacturing stages of the product. You also should clearly state the key duties of each group.

b. The way and approach of the scientists and engineers solving a problem is different. Do you agree to this statement? Justify your answer.

Question 06

The Colombo city planning authority requested a city planning organization to propose suitable features to upgrade the city. Some of the features are underground transportation system, little plots of land with trees, walking ways, supermarket complexes, etc., which would prevent traffic conjunction in the city, enhance the living conditions and also improve the appearance of the city. Assume you are a member of the design team and the team leader has asked you to identify the objectives of this project and expand the selected objectives.

Draw a **diagrammatic tree of objectives showing hierarchical relationships and interconnections.** Explain the reasons to select your major objectives.

Question 07

a. *'Technological innovations have altered the course of history and greatly influenced in further engineering developments.'*
Explain this statement using an appropriate example.

b. It is said that **design cannot stand itself in isolation without its interfaces with society, economy and environment.** Do you agree with this statement? Justify your answer.

Question 08

Answer any **three (03)** of the following.

a. Briefly explain the **Holistic design concept.**

b. The **system boundary** is the conceptual boundary that is used to define the function of the product or device. Clearly explain the consequences of defining/setting this boundary too narrowly and too widely.

c. Explain clearly a **well-defined problem** and **ill-defined problem.**
Note: Your answer should address the respective characteristics in each problem.

d. Explain the importance of **sustainable consumption and production** from the point of engineering. List the ways to promote sustainable consumption and production.

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