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The Open University of Sri Lanka
Faculty of Engineering Technology

Study Programme	:	Bachelor of Technology Honours in Engineering
Name of the Examination	:	Final Examination
Course Code and Title	:	**MEX3174 Principles of Design**
Academic Year	:	2016/17
Date	:	November 16, 2017
Time	:	0930 hrs. – 1230 hrs.
Duration	:	3 hours

General instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of 8 questions. All questions carry equal marks.
3. Answer any 5 questions only.

Question 01

a. *Beehive and weaver birds' nest are two examples of unique designs done by animals to fulfill their basic needs.*
Quoting appropriate examples, distinguish **design by humans** and **design by animals** in the context of evolution and development of the design process.

b. As far as the nature of modern design is concerned, efficient communication is essential and the most widely used method of communication is drawings.

i. Clearly explain why it is essential to have appropriate communication methods in modern manufacturing facility.

ii. Briefly discuss the usage of drawings in design practice and how drawings can be used in evaluating designs.

Question 02

a. *Gordon Clegg states that 'Sometimes the problem is to discover what the problem is'.*

In line with this statement explain the importance of identifying the problem clearly before proceeding with other stages in the design process. You may use appropriate examples if necessary.

b. Humans have been designing for past several decades and there are literally millions of artifacts that worked and worked well such as space craft which landed on the moon. Explain clearly, then why is it still necessary to study and redefine the design process.

Question 03

a. Design Problems are ***ill-structured*** and ***open-ended***. Quoting an appropriate example explain why design problems are said to be ill-structured and open-ended.

b. Figure.Q3a, Figure.Q3b, Figure.Q3c and Figure.Q3d show different types of wheelchairs and there are considerable differences in the configurations and components of these wheelchairs. Quoting at least five (05) main features (example; difference in wheel design) explain why these wheelchairs are so different.
Note: you may answer the question considering the design intent and rationale of each design.

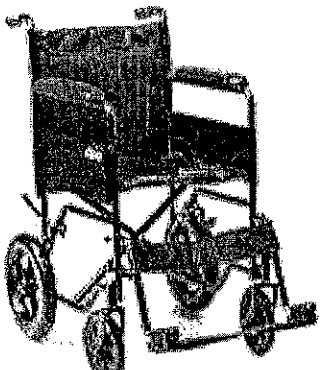


Figure.Q3a

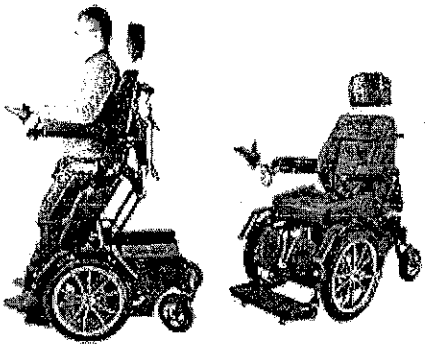


Figure.Q3b



Figure.Q3c



Figure.Q3d

Question 04

a. An important step in designing is to try and clarify the design objectives. State clearly the importance of clarifying objectives in design exercise.

b. State important features of an objective tree diagram.

c. You have been appointed as a design consultant to propose a regional transport system for North Central province which has sacred and ancient districts namely Anuradhapura and Polonnaruwa. These districts attract large numbers of local and foreign pilgrims/visitors. Clarify design objectives sub-objectives with the help of an objective tree diagram.

Question 05

Assume you are the leader of a brainstorming session aimed to generate ideas to design a container for vegetables in order to minimize the wastage in transportation.

a. Explain how you conduct the brainstorming session using the brainstorming strategies and tactics.

b. List five (05) requirements that a container for vegetables should have in order to minimize the wastage in transportation.

c. Other than brainstorming what are the other methods which could be used to gather and analyse ideas.

Question 06

a. Explain the term **Design for sustainability**. Your answer should address at least two (02) concepts of sustainability.

b. Illustrate the production-consumption-disposal cycle and explain why the designers must give sufficient consideration to production-consumption-disposal cycle at the design stages.

c. Explain what Life Cycle Assessment (LCA) of a product is and its importance in product design effort.

Question 07

The aim of the functional analysis is to establish the required functions and the system boundary of a new design.

a. Explain the procedure of implementing functional analysis method.

b. List the consequences of defining the system boundary too narrowly or too broadly.

c. Illustrate the black box representation for a tea brewing process of an automatic tea making machine.

Question 08

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

a. **Aesthetics** and **Ergonomics** are two factors to be considered in Holistic Design. Explain them briefly.

b. Discuss the changes occurred in the traditional design/manufacturing practices with the introduction of Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM).

c. It is said that the **collaborative approach** is important in designing products. Explain your views on this.

d. Explain the term **division of labour** and list its advantages and disadvantages.

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