



ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF MECHANICAL AND PRODUCTION ENGINEERING

Semester Final Examination
Course No.: IPE 4609
Course Title: Product Design I

Summer Semester: A.Y. 2021-2022
Time: 3 hours
Full Marks: 150

Answer all the 6 (six) questions below. Marks distribution and CO-PO mapping are given in brackets.

- Q1. (a) Explain the four C's of design. Briefly discuss the different types of design. [5+5]
(CO2, PO1)
- (b) Set an example of a company and its product(s) to justify the importance of new product design and development. [5]
(CO3, PO4)
- (c) Describe with a schematic diagram the elements of a product development team. Suppose that you are the team leader of a company that produces webcams. Design your core team and explain the roles of the team members. [10]
(CO3, PO3)
- Q2. (a) Discuss the challenges in new product development. Draw the Ulrich-Eppinger model of generic product development process phases and briefly discuss the phases. [7+8]
(CO2, PO1, PO2)
- (b) Draw the flow charts for a rapid iteration and a complex product development process. [4]
(CO2, PO2)
- (c) Provide your opinions on the differences between the design method and the scientific method with the necessary flow diagrams. [6]
(CO3, PO3)
- Q3. (a) Name the eight dimensions of Garvin's Quality. [4]
(CO2, PO1)
- (b) Draw the diagram of the Kano model and explain each feature of the diagram. Identify the car components from the following product description and match them with the relevant Kano features. [8]
(CO3, PO5)
- 'A new modern car is expected to be stopped when a driver manually hits the brakes; however, it will be assisted by its voice-activated parking assistance system. Automatic high beams, 360-degree surround view camera system, keyless entry, and larger wheels with low-profile tires are some of the features that the car is equipped with. The car has an auto dimming mirror feature which helps in preventing driver distraction from bright lights in the rearview mirror. The car also has lane keeping assist which automatically steers or brakes when the car crosses lane markings if the driver has not activated a turn signal.'*
- (c) Discuss with necessary figure the house of quality (HOQ). State the functional requirements that should be adjusted in the product design specification document. [7+6]
(CO2, PO2)

- Q4.** Market analysis data showed that Bangladesh has a demand of 20,00,000 helmets each year. Most helmets do not meet the requirements of a specific helmet standard. A new company is going to manufacture new helmet models for improved safety and comfort and will follow the standard. Before that, they have performed a market analysis to find the customer needs. In the next phase, the company decides to generate a few concepts based on the customer needs. As the responsible employee of the company, **[25]**
(CO3, CO4
PO3, PO4,
PO5)
- (i) Generate two concepts, one using the Six Thinking Hats technique, and another drawing a morphological chart for the new helmet design.
 - (ii) Conduct a SWOT analysis for screening those concepts.
 - (iii) Consider that a concept has been selected. Subsequently, a survey with 1,000 motorcyclists aged 20 to 40 years has been conducted to test the concept and find its potential on the market. The data of the survey report are as follows.

Preference	Definitely not purchase	Probably not purchase	Might or might not purchase	Probably purchase	Definitely purchase
No.	160	220	210	180	230

The company aims to produce 28,000 helmets in the launch year. Calculate the probable number of helmet pieces that may be sold in that particular year after being available on the market. The calibration constants are absent from the previous history.

- Q5.** (a) Show the chasm phase in the potential sales versus time graph and briefly explain the importance of crossing the chasm during a concept test. **[4]**
(CO2, PO2)
- (b) Describe the phases of morphological design of a product. **[15]**
(CO2, PO2)
- (c) Explain the three phases of creative designs. **[6]**
(CO2, PO2)
- Q6.** (a) Determine the importance of human factor in the design of a product. State the characteristics of environmentally responsible designs. **[5+5]**
(CO4, PO6,
PO7)
- (b) Mention four ergonomic factors on which the capability of performing tasks depends. **[4]**
(CO3, PO3)
- (c) Determine four design considerations based on physiological factors that are important to improve the working efficiency of a product. **[4]**
(CO3, PO3)
- (d) State the purpose and key requirements of ISO 9001. Name the seven quality management principles of ISO 9001:2015 **[7]**
(CO2, PO2)