*Total No. of Questions: 6* *Total No. of Printed Pages:3*

**Enrollment No.....**

Faculty of Engineering

End Sem Examination Dec-2024

ME3EL10 Product Design and Development

Programme: B.Tech. Branch/Specialisation: ME

**Duration: 3 Hrs.** **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

| | | | Marks | BL | CO | PO | PSO |
|---|---|---|---|---|---|---|---|
| Q.1 | i. | What is the primary purpose of engineering design?<br>(a) To create aesthetically pleasing products<br>(b) To solve complex problems efficiently<br>(c) To follow a set of predetermined rules<br>(d) To increase manufacturing costs | **1** | 1 | 1 | 1,2,3 | 1,2 |
| | ii. | Which phase involves creating detailed specifications and designs based on the approved concepts?<br>(a) Prototype phase<br>(b) Testing phase<br>(c) Design and development phase<br>(d) Launch phase | **1** | 1 | 1 | 1,2 | 1,2 |
| | iii. | Why is engineering design crucial in product development?<br>(a) It helps reduce the quality of the final product<br>(b) It has no impact on the success of the product<br>(c) It delays the production process<br>(d) It ensures the product meets user needs and specifications | **1** | 1 | 1 | 1,2 | 1,2 |
| | iv. | Which of the following is not a typical aspect considered during product analysis?<br>(a) Customer feedback<br>(b) Cost of production<br>(c) Competitor analysis<br>(d) Employee training | **1** | 1 | 1 | 1,2 | 1 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| v. | What is the primary purpose of using design methods in product development?<br>(a) Enhancing customer service<br>(b) Improving employee training<br>(c) Streamlining the design process<br>(d) Reducing marketing costs | **1** | 1 | 1 | 1,2 | 1 |
| vi. | In a decision tree, what do the branches represent?<br>(a) Possible decisions or events<br>(b) Data points for regression analysis<br>(c) Mean, median, and mode values<br>(d) Graphical representation of equations | **1** | 1 | 1 | 1,2 | 2,3 |
| vii. | How does material selection impact the design process?<br>(a) It has no effect on the outcome<br>(b) It influences the aesthetics of the product<br>(c) It affects the cost and performance of the design<br>(d) It delays the completion of the project | **1** | 1 | 1 | 1,2 | 1 |
| viii. | What is the primary focus of material selection in the conceptual design stage?<br>(a) Aesthetics<br>(b) Cost-effectiveness<br>(c) Functionality<br>(d) Brand popularity | **1** | 1 | 1 | 1,2 | 2 |
| ix. | Which of the following is NOT a typical step in industrial design project management?<br>(a) User feedback analysis<br>(b) Budgeting and resource allocation<br>(c) Timeline planning<br>(d) Legal documentation preparation | **1** | 1 | 1 | 1,2 | 1,3 |
| x. | What is the primary goal of value analysis in the costing of industrial design?<br>(a) To increase production time<br>(b) To reduce manufacturing costs without sacrificing quality<br>(c) To maximize marketing expenses<br>(d) To increase profit margins | **1** | 1 | 1, 2 | 2,3 | 1,2 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Q.2 | i. | Define product design? What are the Four C's of Design? | **2** | 1 | 1 | 1,2 ,3 | 1,2 |
| | ii. | Discuss various types of code and standard. | **3** | 1 | 1 | 1,2 ,3 | 1,2 |
| | iii. | Explain product life cycle. Write essential factors of product design. | **5** | 1 | 1, 2 | 1,2 | 1,2 |
| OR | iv. | Describe morphology of design (first three phases of design). | **5** | 1 | 1 | 1,2 | 1 |



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Q.3 | i. | Explain the Maslow's hierarchy of needs. | **4** | 1 | 1 | 1,2 ,3 | 1,2 ,3 |
| | ii. | Define the QFD (quality function deployment). Discuss economic and production aspects in design. | **6** | 1 | 1, 2 | 1,2 | 1,2 |
| OR | iii. | What is IPR? Discuss the legal and Ethical issues in design? | **6** | 1 | 2 | 1,2 | 1,2 |
| Q.4 | i. | What are various creative thinking methods? Discuss the five why's method with example. | **4** | 1 | 1, 2 | 1,2 ,3 | 1,2 |
| | ii. | Discuss the systematic Methods for Designing. | **6** | 2 | 1, 2 | 1,2 ,3 | 1,2 |
| OR | iii. | Write short notes on-<br>(a) Decision making under certainty<br>(b) Decision making under uncertainty | **6** | 1 | 1 | 1 | 1 |
| Q.5 | i. | Explain performance characteristics of materials. | **4** | 1 | 1, 2 | 1,2 | 1,2 |
| | ii. | What is Material Performance Index? Construct the Model for the Material Performance Index. | **6** | 2 | 1, 2 | 1,2 ,3 | 1,2 |
| OR | iii. | Explain design for brittle fracture, design for fatigue failure, and design for corrosion resistance. | **6** | 2 | 1, 2 | 1,2 ,3 | 1,2 |
| Q.6 | | Attempt any two: | | | | | |
| | i. | Discuss the need and impact of industrial design. | **5** | 1 | 1 | 1,2 ,3 | 1,2 ,3 |
| | ii. | Discuss the concept of design for safety and environmental considerations in product design. | **5** | 1 | 1, 2 | 1,2 | 1,2 |
| | iii. | Discuss various categories of cost in product design. | **5** | 1 | 2 | 1,2 | 1,2 |

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## Marking Scheme

ME3EL10(T) Product Design and Development (T)

| | | | |
|---|---|---|---|
| Q.1 | i) | d) To solve complex problems efficiently | **1** |
| | ii) | c) Design and development phase | **1** |
| | iii) | b) It ensures the product meets user needs and specifications | **1** |
| | iv) | d) Employee training | **1** |
| | v) | c) Streamlining the design process | **1** |
| | vi) | a) Possible decisions or events | **1** |
| | vii) | c) It affects the cost and performance of the design | **1** |
| | viii) | c) Functionality | **1** |
| | ix) | a) User feedback analysis | **1** |
| | x) | b) To reduce manufacturing costs without sacrificing quality | **1** |

| | | | | |
|---|---|---|---|---|
| Q.2 | i. | Define product design? | - 1 marks | **2** |
| | | Four C's of Design | - 1 marks | |
| | ii. | Types of code | - 1.5 marks | **3** |
| | | Types of standard | - 1.5 marks | |
| | iii. | Product life cycle | -2 marks | **5** |
| | | Product life cycle diagram | -1 marks | |
| | | Factors of design | -2 marks | |
| OR | iv. | Describe morphology of design (first three phases of design). | | **5** |
| | | Description | - 2 marks | |
| | | Phase each | - 1 marks | |
| Q.3 | i. | Explain the Maslow's hierarchy of needs. | | **4** |
| | | Statement and concept | -2 marks | |
| | | Diagram | -2 marks | |
| | ii. | Define the QFD (quality function deployment). Discuss economic and production aspects in design. | | **6** |
| | | Definition and concept of QFD | - 2 marks | |
| | | Economic aspect | - 2 marks | |
| | | Production aspect | - 2 marks | |
| OR | iii. | What is IPR? Discuss the legal and Ethical issues in design? | | **6** |
| | | IPR | - 3 marks | |
| | | Legal and ethical issue | - 3 marks | |
| Q.4 | i. | What are various creative thinking methods? Discuss the Five Whys method with example. | | **4** |
| | ii. | Discuss the systematic Methods for Designing. | | **6** |
| OR | iii. | Write short notes on-<br>(a) decision making under certainty<br>(b) decision making under uncertainty | | **6** |
| Q.5 | i. | Explain performance characteristics of materials. | | **4** |
| | ii. | What is Material Performance Index? Construct the Model for the Material Performance Index. | | **6** |
| | | Material performance index | - 2 marks | |
| | | Model construction | -4 marks | |
| OR | iii. | Explain design for brittle fracture, design for fatigue failure, and design for corrosion resistance. | | **6** |
| | | Explain design for each | - 2 marks | |
| Q.6 | | Attempt any two: | | |
| | i. | Discuss the need and impact of industrial design. | | **5** |
| | | Need of industrial design | -2.5 marks | |
| | | Impact of industrial design | -2.5 marks | |
| | ii. | Discuss the concept of design for safety and environmental considerations in product design. | | **5** |
| | | concept of design for safety | -1 marks | |
| | | explanation | -1.5 marks | |
| | | concept of design for environmental | -1 marks | |
| | | explanation | -1.5 marks | |
| | iii. | Discuss various categories of cost in product design. | | **5** |
| | | Names | -1 marks | |
| | | Explanation any two (each) | - 2 marks | |

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