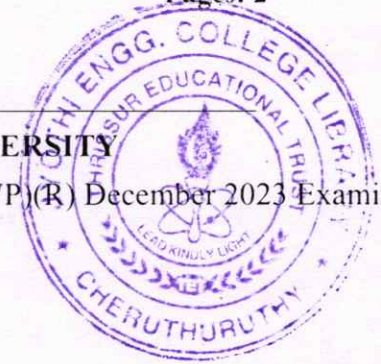


Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S3(S,FE)/S3(PT)(S)/S1 (PT)(S) June 2024 (2019 Scheme)/S3 (WP)(R) December 2023 Examinati

**Course Code: EST200****Course Name: Design and Engineering**

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions. Each question carries 3 marks. Use only hand sketches Marks

- | | | |
|----|--|-----|
| 1 | List the steps in design process. | (3) |
| 2 | Describe the Designer-Client-User triangle in design. | (3) |
| 3 | Explain how design thinking is a non-linear process. | (3) |
| 4 | How does divergent-convergent thinking help in design. | (3) |
| 5 | Explain how drawing and sketches help in design communication. | (3) |
| 6 | List three mathematical tools that help in design modeling. | (3) |
| 7 | How does modular design approach help in design projects? | (3) |
| 8 | What role does value engineering play in design? | (3) |
| 9 | Explain how the nature inspired design can be accommodated in the design of a product. | (3) |
| 10 | What is the role of ethics in design? | (3) |

PART B

Answer any one full question from each module. Each question carries 14 marks

Module 1

- | | | |
|----|--|------|
| 11 | List the customer requirements for designing a pedestrian bridge over a four lane highway. Show how the design objectives were finalized considering the design constraints? | (14) |
| 12 | Illustrate the design of a solar emergency light going through the various stages of the design process. Use hand sketches to show the process. | (14) |

Module 2

- | | | |
|----|---|------|
| 13 | Illustrate the design thinking approach for designing a motorised wheelchair. | (14) |
|----|---|------|

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Describe each stage of the design thinking process and the iterative procedure involved. Use hand sketches to support your arguments.

- 14 Construct a number of possible designs and then refine them to narrow down to the best design for COVID sample collection booth. Show how the divergent-convergent thinking helps in the process. Provide your rationale for each step by using hand sketches only. (14)

Module 3

- 15 Graphically communicate the design of a kitchen knife. Draw the detailed 2D drawings of the same with design detailing, material selection, scale drawings, dimensions, tolerances, etc. Use only hand sketches. (14)
- 16 Describe the role of mathematical modelling in design engineering. Show how mathematics and physics play a role in designing a lift mechanism to carry 10 passengers up a building of 20 floors high. (14)

Module 4

- 17 Show the development of a nature inspired design for keeping buildings cool. Relate between natural and man-made designs. Use hand sketches to support your arguments. (14)
- 18 Show the design of a bicycle and then depict how the design changes when considering 1) aesthetics and 2) ergonomics into consideration. Give hand sketches and explanations to justify the changes in designs. (14)

Module 5

- 19 Examine the changes in the design of a ball point pen with constraints of 1) production methods, 2) life span requirement, 3) reliability issues and 4) environmental factors. Use hand sketches and give proper rationalization for the changes in design. (14)
- 20 Describe the how to estimate the cost of a particular design using ANY of the following: i) a computer, ii) the layout of a factory, iii) the elevation of a building, iv) an electrical or electronic system or device and v) a lorry. Show how economics will influence the engineering designs. Use hand sketches to support your arguments. (14)