**Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_**

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**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **14ME2037** | **Duration :** | **3hrs** |
| **Sub. Name :** | **PRODUCT DESIGN AND DEVELOPMENT STRATEGIES** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Write about the history and importance of the engineering design process. | CO1 | 10 |
| b. | Sketch and explain the product cost committed versus cost incurred during phases of the design process. | CO1 | 10 |
| (OR) | | | | |
| 2. | a. | With a neat sketch explain the expanded product life cycle. | CO1 | 10 |
| b. | Explain the following. i) Benchmarking ii) Reverse engineering | CO1 | 10 |
|  | | | | |
| 3. | a. | Classify the types of engineering models and give an example for each. | CO1 | 10 |
| b. | Discuss the importance of the Prototype in the product design. | CO1 | 10 |
| (OR) | | | | |
| 4. | a. | Expand the various components in the hydel power plant and discuss the model-building process. | CO1 | 10 |
| b. | Explain the importance of the following similitudes.  i) Geometric ii) Dynamic iii) Kinematic iv) Thermal  v) Chemical | CO1 | 10 |
| 5. |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Evaluate the material selection for a cryogenic storage vessel for liquefied natural gas based on the following properties: (1) low-temperature fracture toughness, (2) low-cycle fatigue strength, (3) stiffness, (4) coefficient of thermal expansion (CTE), and (5) cost. Since the tank will be insulated, thermal properties can be neglected in the selection process. Determine the weighting factors for these properties using pairwise comparison. Also Calculate the Scaled property for all the materials and weighted property index. Find out the best material from the material database given below.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Material | Toughness (Relative Scale) | Fatigue strength (N/mm2) | Stiffness (106 N/mm2) | Thermal Expansion (mm/mm °C) | Cost (Rs/kg) | | | 304 Stainless Steel | 5 | 170 | 27.5 | 9.5 | 255 | | 9% Ni Steel | 5 | 40 | 28.2 | 7.6 | 155 | | 3% Ni Steel | 4 | 35 | 27 | 7.1 | 125 | | SS 301-FH | 5 | 195 | 35.5 | 6.3 | 305 | | | CO1 | 20 |
| (OR) | | | | |
| 6. | a. | Consider the product design specification of an automotive disc braking system and discuss the functions required for its materials selection. | CO2 | 10 |
| b. | Discuss the general criteria for materials selection for a new product. | CO2 | 10 |
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| 7. | a. | Discuss the interrelations of design, materials, and processing to produce a product with relevant sketch. | CO2 | 10 |
| b. | Classify the kingdom of engineering materials with a neat flow chart. Give few examples for metals. | CO2 | 10 |
| (OR) | | | | |
| 8. | a. | How does the mechanical loading influence the form design of hoisting gear for a jib crane? | CO2 | 10 |
| b. | Discuss the importance of aesthetics and ergonomics in product design. | CO2 | 10 |
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| **Compulsory:** | | | | |
| 9. | a. | State the use of geometric dimensioning and tolerancing (GD&T) and explain its principles. | CO2 | 10 |
| b. | Sketch all the symbols used in geometric tolerancing and write their importance in manufacturing a product. | CO2 | 10 |