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



**End Semester Examination – Nov / Dec – 2019**

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

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | List out all the seven phases in morphology of design. Explain the first three phases in detail with relevant sketches. | CO1 | 10 |
| b. | Sketch neatly and explain the stages involved in the Expanded product life cycle. | CO1 | 10 |
| **(OR)** | | | | |
| 2. | a. | Compare the scientific method with design method for approaching simplified design process with neat flowcharts. | CO1 | 10 |
| b. | Describe the five important steps involved in Problem-Solving Methodology. | CO1 | 10 |
|  | | | | |
| 3. | a. | Distinguish between concurrent engineering and sequential engineering with relevant sketches. | CO1 | 10 |
| b. | How computer aided engineering helps in better product design. Sketch the cross sectional view of a four stroke IC engine and explain its design analysis. | CO1 | 10 |
| **(OR)** | | | | |
| 4. | a. | Identify and explain the international codes and standards used for product design. List out some major principles of ISO for product design. | CO1 | 10 |
| b. | With neat sketches, explain the stages of design improvement for railcar wheel. | CO1 | 10 |
|  | | | | |
| 5. | a. | Explain the steps in materials selection activities for re-evaluation of an existing product or design to reduce cost, increase reliability, improve performance, etc. | CO1 | 10 |
| b. | With a neat Schematic diagram of the design process, suggest required design tools, materials and process selection to arrive at the best combination of material and manufacturing process. | CO1 | 10 |
| **(OR)** | | | | |
| 6. | a. | List out some important properties and applications of the following.  i) Physical ii) Mechanical iii) Chemical  iv) Electric properties v) Thermal Properties. | CO2 | 10 |
| b. | Suggest a good material required for an Automotive radiator system by considering the product design specifications. | CO2 | 10 |
|  | | | | |
| 7. |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Evaluate the material selection for a cryogenic storage vessel for liquified 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** | **195** | **29.5** | **10.1** | **255** | | **9% Ni Steel** | **5** | **65** | **30.2** | **8.2** | **160** | | **3% Ni Steel** | **4** | **50** | **31** | **8.9** | **150** | | **Ti-6Al-4V** | **5** | **200** | **32** | **7.5** | **295** | | **SS 301-FH** | **5** | **210** | **34.5** | **7.4** | **320** | | | CO2 | 20 |
| **(OR)** | | | | |
| 8. | a. | Explain various simulated service tests performed for a horizontal aluminum alloy motor in case of material substitution. | CO2 | 10 |
| b. | With an example, list out the advantages of the general tolerancing to facilitate easy manufacturing. List out the important symbols used in GD&T. | CO2 | 10 |
|  |  | **Compulsory:** | | |
| 9. | a. | Explain the dimensioning rules and systems for the following with neat sketches.  i) Aligned ii) Unidirectional iii) Tabular iv) Chain. | CO2 | 10 |
| b. | Sketch and explain in detail the technological properties of grey iron castings. | CO2 | 10 |