**Code No.6PE5205ME**

**METHODIST COLLEGE OF ENGINEERING & TECHNOLOGY**

**(An Autonomous Institution)**

**M.E II-Semester (Regular) Examination, September-2023**

**Subject: ADVANCED MACHINE DESIGN**

**Time: 3 hours Max.Marks:60**

**Note: Missing data, if any, maybe suitably assumed.**

**PART-A**

**Answer All the questions. (05X2M=10M)**

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| --- | --- | --- | --- | --- |
| **Q.No** | **Questions** | **Marks** | **CO** | **BTL** |
| **1 a** | Enlist the factors to be considered for material selection in design | **2** | **1** | **1** |
| **b** | Reproduce a S-N curve for steel with endurance limit σe | **2** | **2** | **1** |
| **c** | Recall Griffith theory | **2** | **3** | **1** |
| **d** | Give three applications each of constant amplitude fatigue load and variable amplitude fatigue load. | **2** | **4** | **2** |
| **e** | Enlist modes of surface failures and their causes | **2** | **5** | **1** |

**PART-B**

**Answer Any Five questions. (05X10M=50M)**

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| --- | --- | --- | --- | --- | --- |
| **Q.No.** |  | **Questions** | **Marks** | **CO** | **BTL** |
| **2** | **a** | Summarize in detail the various steps involved in systematic design process of a product. | **5** | **1** | **2** |
| **b** | What are process selection charts? Summarize the uses of process selection charts | **5** | **1** | **2** |
| **3** | **a** | Compare various theories of failures in machine design | **5** | **2** | **3** |
| **b** | Paraphrase different factors influencing S-N behavior | **5** | **2** | **2** |
| **4** | **a** | Determine the energy release rate of a DCB specimen through change in strain energy approach for constant load. | **7** | **3** | **3** |
| **b** | Stress field is the same for plane stress and plane strain problems. Why is it not so for displacement fields? | **3** | **3** | **3** |
| **5** | **a** | Determine nucleation life if a slot is made in a large plate (HY-130 steel) having a tipradius of 2 mm and a length of 40 mm from one edge to another. The plate is subjected to a fatigue load of σmax = 140 MPa and σmin = 0.0 MPa | **7** | **4** | **3** |
| **b** | Recall Miners Rule and explain | **3** | **4** | **2** |
| **6** | **a** | Illustrate Pressure Distributions and Contact Zones of Spherical, Cylindrical, and General Hertzian Contact | **3** | **5** | **2** |
| **b** | Determine the size of the contact patch and the maximum contact stresses for a 20-mmdia steel ball rolled against a 40-mm-dia steel cylinder, 25 cm long, with 10 kN. | **7** | **5** | **3** |
| **7** | **a** | Discuss the design guidelines for sand casting | **5** | **1** | **2** |
| **b** | Explain in detail S-N curve representation and approximation | **5** | **2** | **2** |
| **8** | **a** | Determine the energy release rate, using elementary beam analysis, for the configurations given in Fig. | **5** | **3** | **3** |
| **b** | It is difficult to design components which would not fail due to fatigue loads or stress induced environment-cracking or both. Therefore a crucial component should be routinely checked to identify whether cracks, which have potential to grow and cause the failure of the component, have developed since the last check-up. Comment on these statements. | **5** | **4** | **3** |
| **9** | **a** | Summarize the effect of a sliding component on contact stresses | **5** | **5** | **2** |
| **b** | Explain Design for Reliability in detail | **5** | **1** | **2** |

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