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



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

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| **Code :** | **17ME3005** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ENGINEERING MATERIALS AND APPLICATIONS** | **Max. Marks :** | **100** |

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

**(Note: Use of approved data sheets arepermitted)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | It was happened that when a ship travelled from one place to an another place, it got fractured into two pieces in the middle of the sea. State the technical reason and theory behind this incident. | CO3 | 16 |
| b. | Show the structure of perfect real crystals and explain the critical resolved shear stress with help of related equations. | CO2 | 4 |
| **(OR)** | | |
| 2. | a. | A large plate is fabricated from a steel alloy that has a plane strain fracture toughness of 82.4 MPa m. If, during the service of usage, the plate is exposed to a tensile stress of 345 MPa, determine the minimum length of a surface crack that will lead to fracture. Assume a value of 1.0 for geometrical constant*.* | CO3 | 16 |
| b. | Write the Stages in the cup-and-cone fracture in detail with help of diagrams. | CO2 | 4 |
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| 3. | a. | Using the Larson–Miller data for S-590 iron, predict the time to rupture for a Component that is subjected to a stress of 140 MPa at 800 degree temperature. Also write the reason and technical aspect behind such type of fracture in detail. | CO3 | 16 |
| b. | Define the fracture toughness of a material and briefly write about any one of the impact fracture testing Techniques in detail. | CO1 | 4 |
| **(OR)** | | | | |
| 4. | a. | With the help of a block diagram describe the process involved in obtaining TRIP steel, PATENTED steel and writes its applications. | CO2 | 16 |
| b. | What is maraging steel? Brifly write its formation and properties. | CO3 | 4 |
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| 5. | a. | Draw the stress-strain-temperature data exhibiting the shape memory effect for a typical NiTi SMA and describe the transformation of phases in detail.Alsomention names of few SMA . | CO2 | 16 |
| b. | Show the different methods involved for manufacturing glasses and briefly explain. | CO1 | 4 |
| **(OR)** | | |
| 6. | a. | How the diamonds are formed on the earth? List out the various types of diamonds and explain in detail, how the quality is characterized and quantified. | CO3 | 16 |
| b. | List out the types of silicate ceramics, briefly explain each and mention its applications. | CO2 | 4 |
|  | | |
| 7. | a. | What is metallic glasses? Write the preparation of metallic glasses, properties and characteristics in detail. | CO1 | 16 |
| b. | Write the applications of Graphine and Piezoelectric materials. | CO2 | 4 |
| **(OR)** | | |
| 8. | a. | Show the relation between the specific volume and temperature characteristics of a glass with the help of a graph, describe the formation of an amorphous alloy and brief the preparation techniques involved. | CO2 | 16 |
| b. | Show the ceramics Structure, compositions, types of bonds and briefly explain its properties. | CO3 | 4 |
|  | | **Compulsory:** |  |  |
| 9. | a. | With neat sketches, explain the process of Stir casting, Squeeze casting and Powder metallurgy for manufacturing metal matrix composite. | CO2 | 16 |
| b. | With the help of a block diagram and sketches, briefly explain the classifications of composite materials . | CO1 | 4 |