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

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**End Semester Examination – Nov/Dec – 2017**

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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)**

**Approved Design Data’s are Permitted**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | State and explain with suitable example the energy balance between enthalpy and entropy when a rubber is subjected to stretch and contract. | CO3 | 15 |
| b. | Explain the significance of stress concentration and its effects. | CO2 | 5 |
| (OR) | | | | |
| 2. | a. | Draw the stress-strain curve for an elastomer, ductile, brittle and soft brass materials and explain. | CO3 | 15 |
| b. | Write the principles of fracture mechanics with suitable examples. | CO1 | 5 |
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| 3. | a. | An aircraft wing made of a steel alloy with a plane strain fracture toughness of 48 MPa√m is exposed to a stress of 930 MPa. Will this specimen experience fracture if it is known that the largest surface crack is 0.4 mm long? Explain in detail the theory behind. Assume that the parameter *Y* has a value of 1.0. | CO3 | 15 |
|  | b. | Distinguish between the characteristics of ductile and brittle fracture. | CO2 | 5 |
| (OR) | | | | |
| 4. | a. | It was observed that when a submarine travels in a sea, after long period it reached a point where unexpectedly submarine subjected to a massive crack and broken into two pieces. Write the technical reason behind this incident with help of a graph and figures in detail. | CO3 | 15 |
|  | b. | What is Larson-Miller data? Using the Larson–Miller data for S-590 iron, predict the time to rupture for a component that is subjected to a stress of 60 MPa at 700º C. | CO1 | 5 |
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| 5. | a. | Draw the characteristics of amorphous materials and compare it with glass, ceramic and metals. Also write the manufacturing process of obtaining amorphous materials from the raw materials. | CO2 | 15 |
|  | b. | What is patented steel wire? Write the preparation of patented steel wire, properties and characteristics. | CO1 | 5 |
| (OR) | | | | |
| 6. | a. | Show the relation between the specific volume and temperature characteristics of a metallic glass with help of a graph, describe the formation of an amorphous alloy and brief the preparation techniques involved. | CO2 | 15 |
|  | b. | With help of a block diagram describe the process involved in obtaining maraging steel and show explain the manufacturing methods. | CO2 | 5 |
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| 7. | 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. | CO3 | 15 |
|  | b. | How the diamonds are formed on the earth? List out the various types of diamonds and explain how the quality is characterized and quantified. | CO1 | 5 |
| (OR) | | | | |
| 8. | a. | Using the creep curve, explain three stages of creep with suitable examples. Also write the effect of temperature on these stages? | CO1 | 15 |
|  | b. | Write the various types of ceramic materials, properties, applications and explain how it is technically vary from a glass & metal. | CO2 | 5 |
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|  | | **Compulsory:** |  |  |
| 9. | a. | List out the solid state methods of manufacturing composites and explain the stir casting method with a neat sketch. | CO3 | 15 |
|  | b. | Mention the general way of classification of composite materials and briefly explain. | CO1 | 5 |

ALL THE BEST