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



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

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| **Code :** | **17NT2005** | **Duration :** | **3hrs** |
| **Sub. Name :** | **MATERIALS SCIENCE II** | **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. | Describe the process of welding with a suitable sketch. | CO1 | 3 |
| b. | Cite the advantages of powder metallurgy over casting. | CO1 | 3 |
| c. | Explain in detail, the different types of heat treatment processes for metals. | CO1 | 14 |
| (OR) | | | | |
| 2. | a. | Differentiate sand casting and wax casting. Mention the advantages and disadvantages of each method. | CO1 | 3 |
| b. | Describe the process of continuous casting and mention its advantages. | CO1 | 3 |
| c. | Mention the different metal fabrication techniques. With suitable sketch explain in detail the different forming operations used in metal fabrication. | CO1 | 14 |
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| 3. | a. | Describe the two types of clay products. Give two examples of each and mention their applications. | CO1 | 3 |
| b. | Define crystallization and cite two properties that may be improved by crystallization. | CO1 | 3 |
| c. | List the different ceramic fabrication techniques. With suitable sketch explain in detail the different glass forming processes. | CO1 | 14 |
| (OR) | | | | |
| 4. | a. | Differentiate ceramics and metals. Cite one reason why ceramic materials are, in general harder yet more brittle than metals. | CO1 | 3 |
| b. | Define vitrification. List the factors that affects the degree of vitrification. | CO1 | 12 |
| c. | Discuss in detail about the clay products, refractories and advanced ceramics. | CO1 | 5 |
|  |  |  |  |  |
| 5. | a. | Define the terms “degree of Polymerization” and “polydispersity index”. | CO1 | 3 |
| b. | Differentiate glass transition temperature and melting temperature. | CO1 | 3 |
| c. | Discuss the various mechanisms of deformation in polymers. | CO1 | 4 |
| d. | With a neat sketch, explain in detail the stress-strain behavior of brittle polymer, plastic polymer and elastomer. | CO3 | 10 |
| (OR) | | | | |
| 6. | a. | List the parameters that influences the strengthening of thermoplasts. | CO3 | 3 |
| b. | Define polymers and mention its characteristics. | CO1 | 3 |
| c. | Differentiate thermoplastics and thermosetting plastics with suitable examples. | CO1 | 4 |
| d. | Is it possible to have a poly(vinyl chloride)- C2H3Cl homopolymer with the following molecular weight data, and a degree of polymerization of 1120? Why or Why not**?**  *(Given atomic weight of C=12, H=1 and Cl=35.5)*   |  |  |  | | --- | --- | --- | | **Molecular weight Range (g/mol)** | **wi** | **xi** | | 8,000-20,000 | 0.02 | 0.05 | | 20,000-32,000 | 0.08 | 0.15 | | 32,000-44,000 | 0.17 | 0.21 | | 44,000-56,000 | 0.29 | 0.28 | | 56,000-68,000 | 0.23 | 0.18 | | 68,000-80,000 | 0.16 | 0.10 | | 80,000-92,000 | 0.05 | 0.03 0.03 | | CO1 | 10 |
| 7. | a. | Define whiskers and give examples. | CO2 | 2 |
| b. | Define Critical fiber length for effective stiffening & strengthening. Mention its variation for short thick fibers and long thin fibers. | CO2 | 2 |
| c. | Mention the classification of composites based on reinforcement. Explain each one in detail. | CO2 | 16 |
| (OR) | | | | |
| 8. | a. | Define composite and mention the classification of composite based on matrix material. | CO2 | 4 |
| b. | With suitable sketch, differentiate fiber reinforced composites based on the alignment of fibers. | CO2 | 8 |
| c. | A continuous and aligned fiber-reinforced composite is to be produced consisting of 45 vol% aramid fibers and 55 vol % of a polycarbonate matrix; mechanical characteristics of these two materials are as follows:   |  |  |  | | --- | --- | --- | |  | Modulus of Elasticity (GPa) | Tensile Strength (MPa) | | Aramid fiber | 131 | 3600 | | Polycarbonate | 2.4 | 65 |   Also, the stress on the polycarbonate matrix when the aramid fibers fail is 35 MPa.  For this composite, compute:  i). The longitudinal tensile strength.  ii).The longitudinal modulud of elasticity. | CO2 | 8 |
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|  | | **Compulsory**: |  |  |
| 9. | a. | Distinguish Rayleigh scattering and Tyndall scattering. | CO6 | 3 |
| b. | Discuss in detail, the optical properties of non-metals. | CO6 | 5 |
| c. | Discuss in detail about thermal expansion based on the shape of the energy vs interatomicdistance curve. | CO4 | 6 |
| d. | Explain zero thermal expansion and negative thermal expansion with suitable examples. | CO4 | 6 |