**18ME301**

**Hall Ticket Number:**

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| **II/IV B.TECH (Regular / Supplementary) DEGREE EXAMINATION** | | | |
| **February, 2021** | **Mechanical Engineering** | | |
| **Third Semester** | **Strength of Materials-I** | | |
| **Time:** Three Hours | | **Maximum :** 50 Marks | |
| *Answer ALL Questions from PART-A.* | | | (1X10 = 10 Marks) |
| *Answer* ***ANY FOUR*** *questions from PART-B.* | | | (4X10=40 Marks) |
| Part - A | | | |

1. Answer all questions (1X10=10 Marks)

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| a | What is the difference between Engineering stress and true stress. | CO1 | L3 |
| b | What is allowable stress? | CO1 | L3 |
| c | Define Poisson’s Ratio. | CO1 | L3 |
| d | State Hooke’s law. | CO1 | L3 |
| e | What is meant by statically indeterminate structure? | CO2 | L3 |
| f | Define torsional rigidity. | CO3 | L3 |
| g | List the various types of beams | CO4 | L3 |
| h | What is point of contraflexure? | CO4 | L2 |
| i | Sketch the variation of bending stress distribution across the depth of a rectangular section beam | CO4 | L2 |
| j | What is plane stress? | CO5 | L3 |

**Part - B**

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| 2. | The following observations were made during a tensile test on a mild steel specimen 40mm in diameter and 200mm long. Elongation with 40kN load (within limit of proportionality).  Change in length=0.034mm;  yield load=161kN,  maximum load=242kN,  Length of specimen at fracture=249mm.  Determine:  (i) Modulus of elasticity  (ii) yield point stress  (iii) ultimate stress  (iv) percentage elongation | 10M | CO1 | L2 |

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| 3. | A brass bar, having cross section area 900 mm2 is subjected to axial forces as shown in fig which AB = 0.6m BC = 0.8m and CD = 1.0m. Find the stress in each portion and the total elongation of the bar. Take E = 1 x 105 N/mm2. | 10M | CO1  P.T.O | L1 |

**18ME301**

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| 4. | A steel rod of 15 m long is at a temperature of 15°C. Find the free expansion of the length when the temperature is raised to 65 °C. Also find the thermal stress produced when i) the expansion of the rod is prevented ii) the rod is permitted to expand by 6 mm. Take α = 12 x 10–6 /°C and E = 200 GPa. | 10M | CO2 | L1 |

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| 5. | Derive the torsion equation for a circular shaft and mention the assumptions made in it. | 10 M | CO3 | | L1 | |
| 6. | A simply supported beam of 8m span carries a uniformly distributed load of 3kN/m over a length of 3m, at a distance 2m from the left hand support and also point loads 2kN and 3kN at distances 3m and 5m from the left hand support respectively. Draws shear force and bending moment diagrams. | 10 M | | CO4 | | L1 |

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| 7. | A cantilever beam of length 4m carries a uniformly distributed load of 20 KN/m run over the whole length also carries a point load of 20 KN and 30 KN at a distance of 2m and 3m from the fixed end. Draw the S.F and B.M diagrams. | | | 10M | | | | CO4 | | | L1 |
| 8.a | What are the assumptions made in theory of simple bending? | | 4 M | | | CO4 | | | L3 | | |
| b | A rectangular beam 60 mm x 40 mm is 2 m long and is simply supported at the ends. It carries a point load of 1 KN at mid span. Determine the maximum bending stress induced in the beam.. | | 6 M | | | CO4 | | | L1 | | |
| 9. | | The state of stress at a point in a stressed material is given by σx  = 20 MPa σy  = 10 MPa and τxy  = 25 MPa. Determine the direction and magnitude of the Principal stresses in the material. Also locate the planes of maximum shear stress and calculate the normal and shear stress on these planes. | | | 10M | | CO5 | | | L1 | |

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