

MANIPAL INSTITUTE OF TECHNOLOGY

III SEMESTER B.TECH. (CIVIL ENGINEERING) END SEMESTER EXAMINATIONS, JAN 2017

SUBJECT: MECHANICS OF STRUCTURES [CIE 2102]

REVISED CREDIT SYSTEM (/01/2017)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL the questions.
- ✤ Missing data may be suitable assumed.

| 1A. | Determine the forces in the members BD, BE and CE of the bowstring truss shown in Figure Q1A . | 5 | CO1 |
|-----|--|---|-----|
| 1B. | A symmetrical I section is simply supported on a span 'L' and carries a concentrate load 'W' at mid span. The beam section is 150mm wide and 300mm overall depth with thickness of flange and web of 30mm. If permissible bending and shear stresses are respectively 160MPa and 5.36MPa, calculate the safe values of span and concentrated load. | 5 | CO1 |
| 2A. | The state of stress in an element is as shown in Figure Q2A. Determinei) Principal stresses and their planesii) Normal, tangential and resultant stresses on a plane AB as shown in Figure Q2A. | 5 | CO2 |
| 2B. | Derive the Torsion equation of the form $T/J = \tau/r = G\theta/L$ with usual notations | 5 | CO2 |
| 3A. | From some tests on struts with both ends hinged, two of the results obtained are, Test#1 Test#2 Slenderness ratio 100 200 Average stress at failure 90 MPa 50 MPa Assuming these results are in agreement with Rankine's formula, find the two constants in that formula. What is the value of Young's modulus of the material? | 5 | CO2 |
| 3B. | A live load of 10kN/m and length 8m moves on a SS girder AB of span 15m. Using ILD find maximum BM at a section 'C', 9m from the left end and absolute maximum SF. If the live load is changed to 10kN/m & 18m length, calculate the maximum BM at the section 'C'. | 5 | CO3 |
| 4A. | Determine the slope and deflection at mid span for a simply supported beam of span 6m carrying a downward point load of 30kN at 2m from left support. $E = 204 \times 10^6$ kN/m ² and I=50×10 ⁶ mm ⁴ . Use conjugate beam method. | 5 | CO5 |
| 4B. | Determine horizontal and vertical displacement of the free end C of vertical bent shown in Figure Q4B , using unit load method. | 5 | CO4 |
| 5A. | Using Macaulay's method, determine the vertical displacement at free end C of an overhanging beam shown in Figure Q5A . | 5 | CO4 |
| 5B. | A three hinged parabolic arch of span 40 m and central rise 8 m carries a point load 50kN at a distance 10 m from the left support. Determine the bending moment, radial shear and normal thrust at 32m from left support. | | CO5 |

