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



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

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| **Code :** | **17CE2003** | **Duration :** | **3hrs** |
| **Sub. Name :** | **STRENGTH OF MATERIALS – I** | **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. | State Hooke’s law. | CO1 | 2 |
| b. | The following data refer to a tensile test conducted on a mild steel bar.   1. Diameter of the steel bar = 30mm 2. Gauge length = 200mm 3. Extension at the load of 100kN = 0.139mm 4. Load at elastic limit = 230kN 5. Maximum load = 360kN 6. Total extension = 56mm 7. Diameter of the rod at failure = 22.25mm   Calculate;   1. the Youngs modulus 2. the stress at elastic limit 3. the percentage elongation 4. the percentage decrease in area. | CO3 | 18 |
| **(OR)** | | | | |
| 2. | a. | The principal stress at a point across two planes are 100 N/mm2 (tensile) and 50 N/mm2 (Compressive). Determine the normal, tangential stress and the resultant stress on a plane inclined at 20o to the axis of major stresses. | CO1 | 10 |
| b. | The principal stresses at a point across two perpendicular planes are 120 N/mm2 and 80 N/mm2. Find the normal stress, tangential stress and resultant stress and its obliquity on a plane at 30o with the major principal plane. Find also the intensity of stress which acting alone can produce the same maximum strain. Take poisson’s ratio as 0.20. | CO1 | 10 |
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| 3. |  | Using the method of Tension Coefficients analyse the plane truss shown in figure below and find the forces in all members. | CO3 | 20 |
| **(OR)** | | | | |
| 4. |  | Analyse the truss using method of joints.  Image result for truss members , method of joints | CO3 | 20 |
|  |  |  |  |  |
| 5. | a. | A simply supported beam 8 m long carries a point load of 4kN and 4kN at distances of 4m and 4m from the left end. Draw Shear Force and Bending Moment diagrams for the beam. | CO2, CO4 | 14 |
| b. | Explain the sign conventions for shear force and bending moment in general. | CO2 | 6 |
| **(OR)** | | | | |
| 6. |  | A square beam 20mm x 20mm in section and 2m long is supported at the ends. The beam fails when a point load of 400 N is applied at the centre of the beam. What uniformly distributed load per metre length will break a cantilever of the same material 40mm wide, 60mm deep and 3m long? | CO4 | 20 |
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| 7. | a. | A hollow shaft of external diameter 120 mm transmits 200 kW power at 150 r.p.m. Determine the maximum internal diameter if the maximum stress in the shaft is not to exceed 60 N/mm2. | CO3 | 10 |
| b. | Find the maximum shear stress induced in a solid circular shaft of diameter 20 mm when the shaft transmits 200 kW power at 150 r.p.m. | CO3 | 10 |
| **(OR)** | | | | |
| 8. |  | A close-coiled helical spring of 10cm mean diameter is made up of 1.0cm diameter rod and has 20 turns. The spring carried an axial load of 300 N. Determine the shearing stress. Taking the value of modulus of rigidity is 8.2x104 N/mm2, determine the deflection when carrying this load. Also calculate the stiffness of the spring and frequency of free vibration of a mass hanging from it. | CO6 | 20 |
|  | | **Compulsory**: |  |  |
| 9. |  | A beam of length 5m and of uniform rectangular section is simply supported at its ends. It carries a udl of 9kN/m run over the entire length. Calculate the width and depth of the beam if permissible bending stress is 7 N/mm2 and central deflection not to exceed 1cm. | CO4 | 20 |