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

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

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| **Code :** | **14CE2006** | **Duration :** | **3hrs** |
| **Sub. Name :** | **STRENGTH OF MATERIALS** | **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 Beam ABCD is simply supported at its ends A and D over a span of 30 meters. It is made up of three portions AB, BC, and CD each 10 m in length. The moments of inertia of the section of these portion are I, 3I and 2I respectively, where I= 2 x 1010 mm4. The beam carries a point load of 150 kN at B and a point load of 300 kN at C from left support. Neglecting the weight of the beam. Calculate the Slope at A and Deflection at C. By using Conjugate Beam method. Take E = 2 x 102 kN/mm2 | CO2 | 20 |
| (OR) | | | | |
| 2. | a. | Determine the maximum deflection and the maximum slope for the beam loaded as shown in figure. Using Macaulay’s method. Take flexural rigidity EI = 15 x 109 kN-mm2 | CO1 | 13 |
| b. | Determine the displacement at free end of cantilever beam shown in figure. Take E = 2 x 105 N/mm2 and I = 180 x 106 mm4 | CO1 | 7 |
| 3. |  | A fixed beam of length 6 m carries point loads of 160 kN and 120 kN at a distance of 2 m and 4 m from the left end A. Find the fixed end moments and the reactions at the supports. Draw B.M and S.F diagrams. | CO1 | 20 |
| (OR) | | | | |
| 4. |  | A continuous beam ABC of uniform section, with span AB and BC as 4m each, is fixed at A and simply supported at B and C. The beam AB is carrying a uniformly distributed load of 5 kN/m. Span BC carries a point load of 4 kN at a distance 3m from point B. Find the support moments and reactions. Draw the shear force and bending moment diagrams. | CO1 | 20 |
| 5. |  | A simply supported beam of length 4m is subjected to a uniformly distributed load of 30 kN/m over the whole span and deflects 15 mm at the center. Determine the crippling load when this beam is used as a column the following conditions:  i. one end is fixed and other end hinged ii. both the ends pin jointed  iii. Both the ends fixed | CO2, CO3 | 20 |
| (OR) | | | | |
| 6. | a. | The external and internal diameter of a hollow cast iron column 50 mm and 40 mm respectively. If the length of this column is 3 m and both of its ends are fixed, determine the crippling load using Euler’s and Rankine’s formula. Take E= 200GPa , maximum permissible compressive stress is 320 N/mm2 and a = 1/7500. | CO2, CO3 | 18 |
|  | b. | Compare the failure of long column with that of a short column due to axial compression. | CO1, CO3 | 2 |
| 7. |  | A cantilever of I section 2.4m long is subjected to a load of 200kN at the free end. Determine the resulting bending stress at corners of the top flange on the fixed end of the cantilever. The load is inclined at 20o to the vertical and passing through the centroid of the section. Thickness of web=2mm. thickness of flange = 2.5 mm.  50 mm  30 mm  A  C  D  B  2.5 mm  2.5 mm  20°  P = 200 N  X′  XU  X′  XU  Y′  Y′  YU  YU | CO2 | 20 |
| (OR) | | | | |
| 8. | a. | A CI pipe has 10cm internal diameter and 50mm thick wall and carries water under pressure of 5N/mm2. Calculate Maximum and Minimum hoop stress and sketch the distribution of stress intensity | CO3 | 8 |
|  | b. | A cylindrical shell is 3m long and it is having 1 m internal diameter and 15mm thickness. Calculate the maximum intensity of shear stress induced and also the changes in the dimensions of the cylindrical shell. If it is subjected to an internal pressure of 1.5 N/mm2. Take E= 2X105 N/mm2 and 1/m = 0.3. | CO3 | 12 |
|  | | **Compulsory:** |  |  |
| 9. | a. | Explain any three theories of failure. | CO3 | 12 |
|  | b. | A shaft is loaded by a torque of 5 kN-m. The material has a yield point of 350 MPa. Find the required diameter using i. Maximum shear stress theory ii. Maximum distortion energy theory. Take a factor of safety of 2.5. | CO3 | 8 |

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