**20CE303**

**Hall Ticket Number:**

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| **II/IV B.Tech (Regular) DEGREE EXAMINATION** | | | |
| **March, 2022** | **Civil Engineering** | | |
| **Third Semester** | **Solid Mechanics** | | |
| **Time:** Three Hours | | **Maximum:7**0 Marks | |
| *Answer Question No.1 compulsorily.* | | | (14X1 = 14 Marks) |
| *Answer ONE question from each unit.* | | | (4X14=56 Marks) |

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| 1. | a) | | Define Hook’s law. | CO1 | |  |
|  | b) | | Define Coefficient of thermal expansion. | CO2 | |  |
|  | c) | | Volumetric strain for a rectangular specimen of length ‘*l*’, breadth ‘*b*’ and thickness ‘*t*’ subjected to a pull of ‘*P*’ is given by | CO1 | |  |
|  | d) | | The section modulus of a circular section about an axis through its C.G., is | CO4 | |  |
|  | e) | | Draw stress-strain curve for mild steel bar in tension. | CO3 | |  |
|  | f) | | Define circumferential stress. | CO2 | |  |
|  | g) | | Write the bending equation and expand the terms | CO3 | |  |
|  | h) | | When a closely-coiled helical spring of mean diameter (*D*) is subjected to an axial load (*W*), the stiffness of the spring is given by | CO5 | |  |
|  | i) | | Define strain | CO1 | |  |
|  | j) | | Define point of contra flexure in a beam. | CO5 | |  |
|  | k) | | Define shear stress | CO3 | |  |
|  | l) | | A thin cylindrical shell of diameter (*d*) and thickness (*t*) is subjected to an internal pressure (*p*). The ratio of longitudinal strain to volumetric strain is | CO2 | |  |
|  | m) | | What do you mean flexural rigidity. | CO4 | |  |
|  | n) | | Define stiffness of a spring. | CO5 | |  |
| **Unit – I** | | | | | | |
| 2. |  | Derive the elastic constants   1. E&G ii. E & K iii. E,G & K. | | CO1 | 14M | |
| **(OR)** | | | | | | |
| 3. |  | A closed cylindrical vessel made of steel plates 4 mm thick with plane ends, carries fluid under a pressure of 3N/mm2.The diameter of the cylinder is 25 cm and length is 75 cm, calculate the longitudinal and hoop stress in the cylinder wall and determine the change in the in diameter, length and volume of the cylinder. Take E= 2.1x105 N/mm2 and Poisson’s ratios is 0.286. | | CO2 | | 14M |
| **Unit – II** | | | | | | |
| 4. |  | A simply supported beam of length 10 m carries the uniformly distributed load and two point loads as shown fig. Draw the shear force and bending moment diagrams for the beam. Also calculate the maximum bending moment. | | CO3 | | 14M |
| **(OR)** | | | | | | |
| 5. |  | Draw SFD and BMD for the beam shown in figure | | CO3 | | 14M |
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| **Unit – III** | | | | | | |
| 6. | a) | State the assumptions involved in the theory of simple bending | | CO4 | | 6M |
|  | b) | Derive pure bending equation. | | CO4 | | 8M |
| **(OR)** | | | | | | |
| 7. |  | A beam of square cross section150 mm is placed in such a way that its diagonal is the neutral axis. It is subjected to a shear force of 6 kN. Sketch the variation of shear stress along the depth of the beam. | | CO4 | | 14M |
| **Unit – IV** | | | | | | |
| 8. | a) | Derive the pure torsional equation for circular shaft. | | CO5 | | 8M |
|  | b) | State assumptions made in the derivation of pure torsional equation. | | CO5 | | 6M |
| **(OR)** | | | | | | |
| 9. | a) | Prove that the deflection of a close-coiled helical spring at the centre due to axial load W is given by | | CO5 | | 7M |
|  | b) | A close coiled helical spring of 10 cm diameter is made up of 1 cm diameter rod and has 20 turns. The spring carries an axial load of 200 N. Determine the shearing stress. Taking the value of modulus of rigidity = 8.4 x 104 N/mm2, determine the deflection when carrying this load. Also calculate the stiffness of the spring. | | CO5 | | 7M |

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