**20CE303**

**Hall Ticket Number:**

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| **II/IV B.Tech (Regular/Supplementary) DEGREE EXAMINATION** | | | |
| **January, 2024** | **Civil Engineering** | | |
| **Sixth Semester** | **Solid Mechanics** | | |
| **Time:** Three Hours | | **Maximum:** 70 Marks | |
| ***Answer question 1 compulsory.*** | | | **(14X1 = 14Marks)** |
| ***Answer one question from each unit.*** | | | **(4X14=56 Marks)** |
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|  |  |  | CO | BL | M |
| 1 | a) | A steel bar of 40 mm × 40 mm square cross-section is subjected to an axial compressive load of 200 kN. If the length of the bar is 2 m and E = 200 GPa, Find the elongation produced in the bar. | CO1 | L1 | 1M |
|  | b) | Draw stress-strain curve for mild steel bar in tension. | CO1 | L1 | 1M |
|  | c) | Define the term point of contraflexure. | CO2 | L1 | 1M |
|  | d) | Name any two types of supports provided for beams. | CO2 | L1 | 1M |
|  | e) | Define Neutral Axis. | CO3 | L1 | 1M |
|  | f) | Draw the Shear stress diagram for I- section | CO3 | L2 | 1M |
|  | g) | What is the section modulus of a circular section about an axis through its C.G? | CO3 | L1 | 1M |
|  | h) | Define the term flexural rigidity in beams | CO3 | L1 | 1M |
|  | i) | Define Bulk modulus. | CO1 | L1 | 1M |
|  | j) | A thin cylindrical shell of diameter (d) and thickness (t) is subjected to an internal pressure (p). Write the equation to find hoop stress developed in the cylinder. | CO1 | L2 | 1M |
|  | k) | What are the different types of loads acting on a beam? | CO2 | L1 | 1M |
|  | l) | Define the term torsional rigidity | CO4 | L1 | 1M |
|  | m) | Define the term pure Torsion | CO4 | L1 | 1M |
|  | n) | Write the equation for deflection produced in the closely coiled helical spring. | CO4 | L2 | 1M |
| **Unit-I** | | | | | |
| 2 | a) | Two brass rods and one steel rod together supports a load as shown in fig. If the stresses in brass and steel are not to exceed 60 N/mm2 and 120 N/ mm2, find the safe load that can be supported. Take E for steel = 2x105 N/ mm2 and for brass =1x105N/ mm2. The cross-sectional area of steel rod is 1500 mm2 and of each brass rod is 1000 mm2. | CO1 | L3 | 10M |
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|  | b) | A thin cylindrical shell 2.5m long has 700 mm internal diameters and 8mm thickness, if the shell is subjects to an internal pressure of 1Mpa, find,  (i) The hoop and longitudinal stresses developed  ii) The change in diameter, length, and volume.  Take modulus of elasticity of the wall material as 200Gpa and poison’s ratio as 0.3 | CO1 | L3 | 4M |
| **(OR)** | | | | | |
| 3 | a) | Derive the relation between three modulii E, G and K. | CO1 | L4 | 10M |
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|  | b) | A steel bar of 300 mm long, 50 mm wide & 40 mm thick is subjected to pull of 300 kN in direction of its length. Determine the change in volume. Take E = 2x105 N/mm2 , μ=0.25. | CO1 | L2 | 4M |
| **Unit-II** | | | | | |
| 4 |  | Analyse the beam and Draw the SFD and BMD shown below. | CO2 | L4 | 14M |
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| **(OR)** | | | | | |
| 5 |  | Analyse the beam and Draw the SFD and BMD shown below. | CO2 | L4 | 14M |
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| **Unit-III** | | | | | |
| 6 | a) | Derive Pure Bending Equation  M / I = σb /y = E / R | CO3 | L4 | 10M |
|  | b) | Write assumptions made in the pure bending equation. | CO3 | L2 | 4M |
| **(OR)** | | | | | |
| 7 |  | A cast Iron beam is of T- section has the following dimensions Flange: 100 mm x 20 mm, Web: 80 mm x 20 mm. The beam is simply supported on a span of 8 meters and carries a uniformly distributed load of 1.5 KN/m length of entire span. Sketch the shear stress distribution across the cross section indicating salient points. | CO3 | L4 | 14M |
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| **Unit-IV** | | | | | |
| 8 |  | Derive the relation for a circular shaft when subjected to pure torsion and write assumptions. | CO4 | L4 | 14M |
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| **(OR)** | | | | | |
| 9 | a) | A closely coil helical spring of round steel wire 10 mm in diameter having 10 complete turns witha mean diameter of 12 cm is subjected to an axial load of 200 N. Determine: (i) Deflection of the beam spring (ii) Maximum shear stress in the wire and (iii) Stiffness of the spring. Take G (shear modulus) = 8x104 N/mm2. | CO4 | L3 | 8M |
|  | b) | A hollow shaft is to transmit 300kW power at 80 rpm. If the shear stress is not exceeded 60 N/mm2 and the internal diameter is 0.6 of the external diameter, Find the external and internal diameters assuming that the maximum torque is 1.4 times the mean. | CO4 | L3 | 6M |

