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**PRESIDENCY UNIVERSITY**

**Bengaluru**

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| **End - Term Examinations – JANUARY 2025** |
| **Date:** 11 – 01- 2025 **Time:** 01:00 pm – 04:00 pm |

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| **School:** SOE | **Program:** B Tech CIV | |
| **Course Code :**CIV2007­\_V03 | **Course Name :**Strength of Materials | |
| **Semester**: III | **Max Marks**: 100 | **Weightage**: 50% |

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| **CO - Levels** | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
| **Marks** | **19** | **19** | **31** | **31** | **-** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Do not write anything on the question paper other than roll number.*

**Part A**

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| **Answer ALL the Questions. Each question carries 2marks. 10Q x 2M=20M** | | | | |
| **1** | Write the formulas for Stress and Strain. | **2 Marks** | **L1** | **CO1** |
| **2** | What will be the Modulus of rigidity if the value of modulus of elasticity is 2X105 N/mm2 and Poisson’s ratio is 0.25? | **2 Marks** | **L2** | **CO1** |
| **3** | Define Shear force and Bending Moment. | **2 Marks** | **L1** | **CO2** |
| **4** | Determine the moment at fixed end. | **2 Marks** | **L2** | **CO2** |
| **5** | Define Torsional strength and Torsional Rigidity. | **2 Marks** | **L1** | **CO3** |
| **6** | Write the expression for Power transmitted by the shaft and calculate the power at 100rpm if a torque of 7.5X106 Nmm is induced. | **2 Marks** | **L1** | **CO3** |
| **7** | A solid shaft of 150 mm diameter is used to transmit a torque. Find the maximum torque transmitted by the shaft if the maximum shear stress induced to the shaft is 45 N/mm2. | **2 Marks** | **L2** | **CO3** |
| **8** | Define Slenderness ratio of a column and differentiate between a long column and a short column. | **2 Marks** | **L1** | **CO4** |
| **9** | Define a Crippling load and write the expression of the crippling load when both the ends of the column are fixed. | **2 Marks** | **L1** | **CO4** |
| **10** | Determine the safe load if the crippling load is 1080kN and factor of safety is 3. | **2 Marks** | **L2** | **CO4** |

**Part B**

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| **Answer the Questions. Total Marks 80** | | | | | |
| **11.** | **a.** | A compound bar consists of a circular rod of steel of diameter 20mm rigidly fitted into a copper tube of internal diameter 20mm and thickness 5mm. If the bar is subjected to a load of 100kN, find the stresses developed in the two materials. Take E of steel and copper as 2X105 N/mm2 and 1.2X105 N/mm2, respectively. | **15 Marks** | **L3** | **CO1** |
| **or** | | | | | |
| **12.** | **a.** | A member ABCD is subjected to point loads P1, P2, P3 and P4 as shown in the Fig. Calculate the force P3 necessary for equilibrium if P1 =120 kN, P2=220 kN and P4 =160 kN. Determine also the net change in the length of the member. Take E=200 GN/m2. | **15 Marks** | **L3** | **CO1** |
|  |  |  |  |  |  |
| **13.** | **a.** | Draw the SFD and BMD for the over hanging beam shown in Fig. Indicate all significant values including point of contra flexure. | **15 Marks** | **L3** | **CO2** |
| **or** | | | | | |
| **14.** | **a.** | A cast iron bracket subjected to bending has a cross-section of I form with as shown in the figure. The beam is simply supported on a span of 6m. If the tensile stress does not exceed 25 N/mm2, find the safe uniformly distributed load the beam can carry. | **15 Marks** | **L3** | **CO2** |

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| **15.** | **a.** | 500Kw power has to be transmitted at 200rpm. Find the (a) necessary diameter of a solid circular shaft, and (b) necessary diameter of a hollow circular shaft, whose inside diameter is ¾ of the external diameter.  Allowable shear stress is 75 N/mm2. | **25**  **Marks** | **L3** | **CO3** |
| **Or** | | | | | |
| **16.** | **a.** | Calculate the angle of twist in degrees for a solid steel shaft of length of 8m transmitting 150kW at 200rpm. Taking allowable shear stress of 70 N/mm2, also find the suitable diameter of the shaft. Take C= 8.2 X 104 N/mm2 for the material of the shaft. | **25 Marks** | **L3** | **CO3** |

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| **17.** | **a.** | A 3m long hollow circular column with inner to outer diameter ratio 0.8, carry a load of 140kN. One end of column is fixed & the other end is hinged. Determine diameters of column. Takingallowable stress 320MPa. Rankine’s constant a = 1/7500. Take FOS = 2 | **25**  **Marks** | **L3** | **CO4** |
| **Or** | | | | | |
| **18.** | **a.** | A hollow C.I. column whose outside diameter is 200mm has a thickness of 20mm. It is 4.5m long and is fixed at both ends. Calculate the safe load by Rankine's formula using a factor of safety of 4. Calculate the slenderness ratio and the ratio of Euler's and Rankine's critical loads. Take fc = 550 N/mm2, a = 1/1600 in Rankine’s formula & E = 9.4 x 104 N/mm2. | **25**  **Marks** | **L3** | **CO4** |

**\*\*\*\*\* BEST WISHES \*\*\*\*\***