

## III SEMESTER B.TECH. END SEMESTER EXAMINATIONS NOVEMBER 2017

SUBJECT: MECHANICS OF STRUCTURES [CIE 2102]

Date of Exam: 18/11/2017 Time of Exam: 9:00 AM to 12 NOON Max. Marks: 50

## Instructions to Candidates:

Answer ALL the questions & missing data may be suitably assumed

1A.	Determine the forces in all the members of the truss shown in <b>Fig.Q1A</b> . Tabulate the magnitude of the forces indicating the nature of forces	5	CO1
1B.	A cantilever beam of symmetrical I-Section has a span of "L". The beam carries a point load of "W" at the free end. The flanges have a width of <b>125mm</b> with thickness of both flanges and web at <b>20mm</b> . The overall depth of the section is <b>300mm</b> . If the maximum bending stress and maximum shear stress are restricted to <b>100MPa</b> and <b>50MPa</b> respectively, calculate the values of "L" and "W".	5	CO1
2A.	A solid steel shaft is to transmit a power of <b>325kW</b> at <b>120 rpm</b> . If the shear stress is not to exceed <b>40MPa</b> , find the diameter required. Now the shaft is replaced by a hollow shaft of the same material and length with diameter ratio <b>3:5</b> .Calculate the percentage saving in weight, if the shear stress remains unchanged	5	CO2
2B.	Define principal stress and principal plane   Find the principal stresses and maximum shear stress with corresponding planes in the material for the following cases   (i) A solid shaft 100 mm diameter subjected to a torque of 6kNm   (ii) A solid rectangular steel bar of cross section 100mmx 50mm and length 300mm subjected to compressive load of 50kN along its longitudinal axis	5	CO2
3A.	A hollow circular cast iron column <b>5m</b> long, fixed at both the ends is required to carry an axial load of <b>600kN</b> . Determine the section of the column using a factor of safety of <b>4</b> . The thickness of the wall is to be <b>1/10</b> the external diameter. Rankine's constant $\alpha$ = <b>1/1600</b> , crushing strength of cast iron $\sigma_c$ = <b>570 MPa</b>	5	CO2
3B.	The wheel loads shown in <b>FigQ3B</b> . roll over a simply supported beam of span <b>20m</b> . Find the maximum bending moment and shear force at a section <b>7m</b> from the left support. Assume that load can move in either direction. Also calculate the absolute maximum bending moment	5	CO3
<b>4</b> A.	Determine the vertical displacement at the free end of a cantilever beam of span $3m$ subjected to downward UDL $20kN/m$ on entire span and clockwise moment $20kN-m$ at the free end. $E = 25000MPa$ and $I=2\times10^9 mm^4$ . EI is constant. Make use of Castigliano's theorem considering strain energy stored due to bending only	5	CO4
4B.	Using Macaulay's method, determine the vertical displacement at mid-point of simply supported beam of span <b>8m</b> carrying downward UDL of <b>25kN/m</b> on left quarter span along with an anticlockwise moment <b>15kN-m</b> at mid span. Assume uniform EI	5	CO4
5A.	Determine the slope and deflection at mid span for a simply supported beam of span $8m$ carrying a downward point load of $50kN$ at $3m$ from right support. E = $200GPa$ and I= $50 \times 10^6$ mm <sup>4</sup> . Use moment area method. EI is uniform.	5	CO5

5B.
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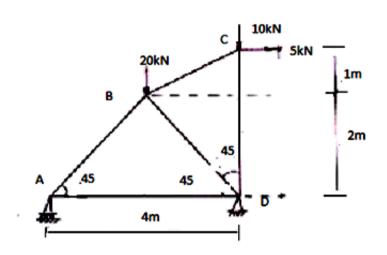


Fig.Q1A

