Make SET-2

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MANIPAL INSTITUTE OF TECHNOLOGY

THIRD SEMESTER B. TECH. (CIVIL ENGINEERING)

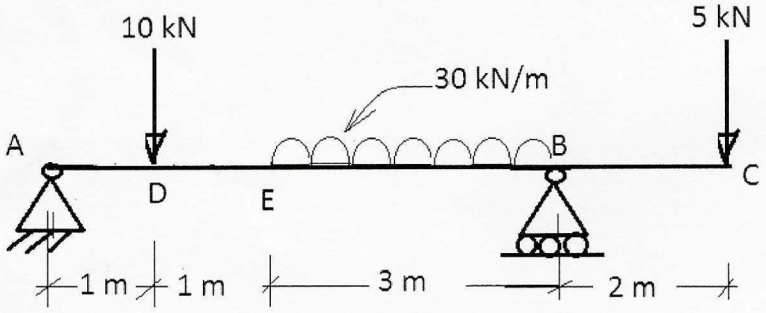
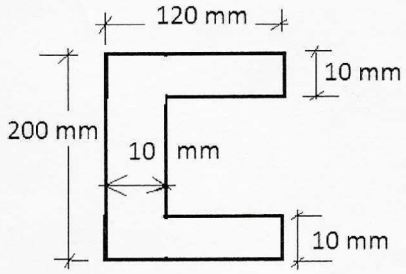
END SEMESTER EXAMINATION, DEC 2022

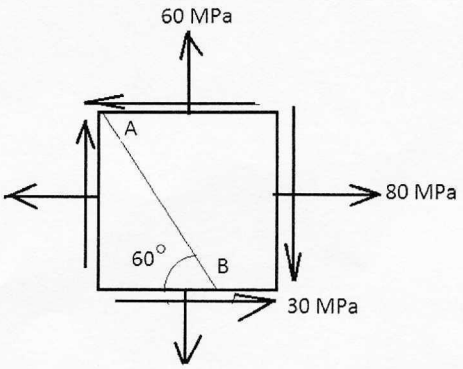
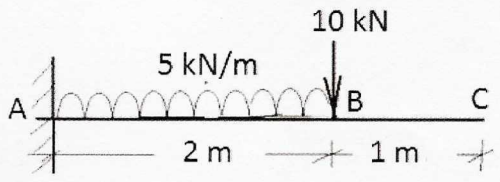
MECHANICS OF STRUCTURES (CIE 2153)

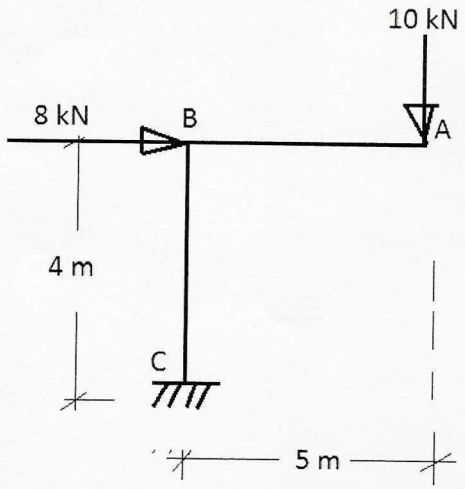
(-12 - 2022)

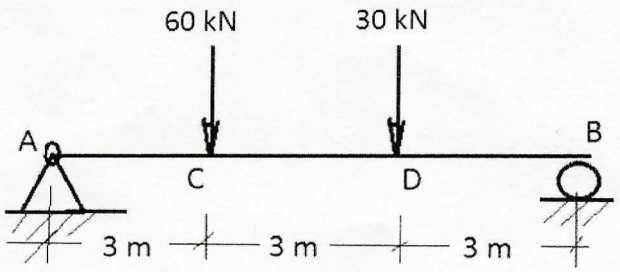
TIME: 3 HRS. **MAX. MARKS: 50**

Note: 1. Answer all questions.
2. Any missing data may be suitably assumed.
3. Use of FORMULA TABLE is permitted

Q. No.	QUESTION	MARKS	CO	BL
1A	For the beam loaded as shown in the below Figure, draw the SFD and BMD. Locate the points of contra-flexure, if any. 	5	1	4
1B	A cantilever beam of span 2 m has the cross section shown in the below Figure. Determine what is the maximum point load it can carry at the free end if the maximum bending stress is limited to 45 MPa. 	3	2	4

1C	For the element carrying stresses as shown in the below Figure, determine the normal and tangential stresses acting on the plane AB inclined as shown.  	**2**	**2**	**3**
2A	A three hinged parabolic arch of horizontal span 16 m and central vertical rise 3 m carries a UDL 30 kN/m over the left half of its span. Determine the bending moment, normal thrust and radial shear at a point 2 m from the left support.	**5**	**3**	**4**
2B	A three hinged parabolic arch of horizontal span 40 m and central vertical height 8 m carries a UDL of 30 kN/m over the right half of its span. Determine the bending moment at a point 10 m from left support, and also another point 10 m from the right support.	**3**	**3**	**4**
2C	A column of effective length 4 m has a rectangular cross section 300 mm X 250 mm. Determine the Euler's buckling load on the column if the E = 200 GN/m^2.	**2**	**3**	**3**
3A	A simply supported beam AB of span 6 m carries a point load 100 kN at 4 m from the support A. Determine the slope and deflection at mid span. Use Moment area theorem. Take constant EI.	**5**	**4**	**4**
3B	The below Figure shows a loaded cantilever beam. Determine slope and deflection at the point C. Use Macaulay's method of Double Integration. Take EI constant throughout the length of the beam.  	**3**	**4**	**3**

3C	A simply supported beam of span L carries a central concentrated load W. Determine the maximum deflection using the conjugate beam method.	**2**	**4**	**4**
4A	The bend ABC shown in the figure is fixed at C, carries a concentrated vertical load of 10 kN at thr free end, A and a concentrated horizontal load at of 8 kN at B. Using Unit-Load method determine the vertical deflection of point A. Assume constant EI. 	**5**	**5**	**4**
4B	A cantilever beam AB, of length 'L' carries an UDL of 'w' per unit length over entire length. Determine the slope and deflection at the free end of the beam using Unit-Load method of strain energy principle. Take EI constant.	**3**	**5**	**4**
4C	A cantilever beam AB of length 2 m fixed at A, carries a point load of 18 kN at the free end. Using Conjugate beam method determine the slope deflection at the free end. Take EI constant.	**2**	**4**	**4**
5A	Figure shows a simply supported beam AB of span 9 m carrying two point loads 60 kN and 30 kN at 3 m and 6 m from the support A respectively. Use Castigliano's Theorem to determine deflection under the 60 kN load. Take E = 200 GPa and I = 18 x 10^6 mm^4.	**5**	**5**	**4**

				
5B	A simply supported beam AB of span 3 m carries a point load of 50 kN at 1 m from the left support, A. Determine the strain energy stored in the beam. Take EI = 1200 kN-m^2. Using strain energy stored in the beam determine the deflection under the point load.	**3**	**5**	**4**
5C	A solid circular bar of length 700 mm and diameter 32 mm is subjected to a torque of 2 kN-m. Determine the strain energy stored in the bar. Take modulus of rigidity of the material as 100 GPa and modulus of elasticity as 200 GPa.	**2**	**5**	**4**