Regular

MANIPAL INSTITUTE OF TECHNOLOGY

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III SEMESTER B.TECH. END SEMESTER EXAMINATIONS

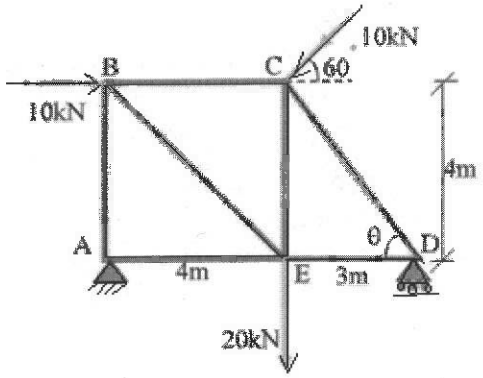
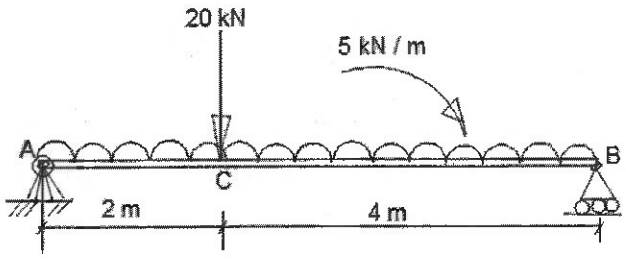
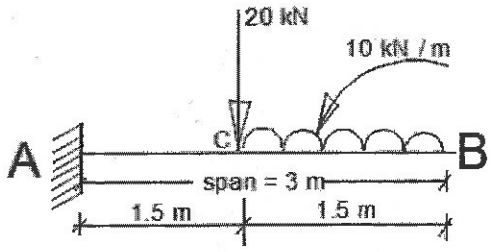
MARCH 2021

SUBJECT: MECHANICS OF STRUCTURES [CIE 2153]

Date of Exam: **03/03/2021** Time of Exam: **2:00 PM to 5:00 PM** Max. Marks: **50**

Instructions to Candidates:

- Answer ALL the questions & missing data may be suitably assumed

1A	Calculate the forces in members BE and BC of the truss shown in the Figure. 	2	CO1
1B	Draw the shear force and bending moment diagram for the simply supported beam, AB of span 6 m and loaded as shown in the figure. 	3	CO1
1C	Find the slope and deflection at point C (under the point load) for the loaded cantilever beam, AB shown in the figure. Use Macaulay's method of double integration. Assume uniform EI throughout the span. 	5	CO4

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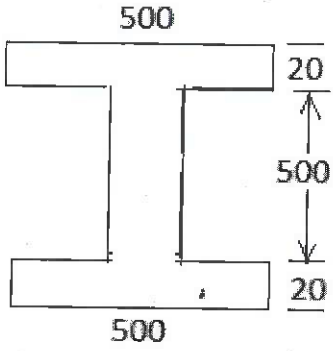
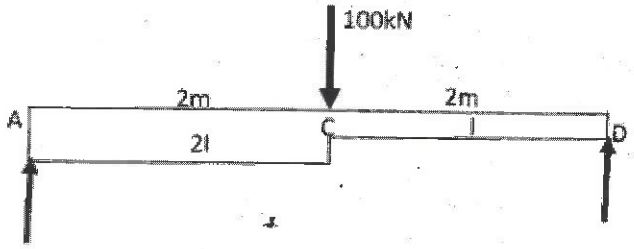
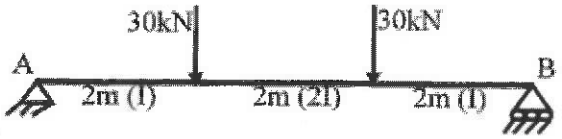
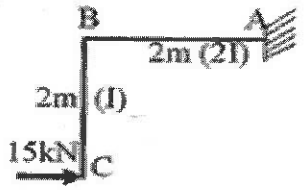
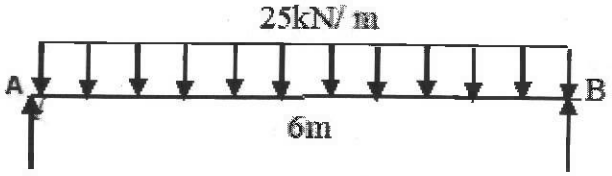
2A	Determine the maximum compressive bending stress on a cantilever beam of span 3m subjected to downward UDL 12kN/m throughout. Cross section of the beam is hollow square tube of size 100mmx100mm (outer dimension) and 10mm thick.	2	CO2
2B	Plot the shear stress variation across the depth of the symmetrical I section having flange 500 mm x 20 mm and web 20 mm x 500 mm.when the cross section is subjected to shear force of 70kN. 	3	CO2
2C	A 100 kN concentrated load acts at mid span of a simply supported beam of span 4m. The beam has moment of inertia 'I' for half the span and '2I' for the remaining half of the span. Using Moment area method, calculate the deflection under the concentrated load and slopes at both the supports. Take EI = 20,000 kN-m^2. 	5	CO4
3A	A hollow shaft 4m long must transmit a torque of 60 kN-m. If the total angle of twist in this length is 3° and the corresponding shear stress is 90 MPa, determine the external and internal diameter of the shaft. Take G = 80GPa.	2	CO2
3B	Determine the Euler's critical load for a solid column of rectangular cross-section 150 mm x 100 mm, with both the ends fixed and the length between the fixed end is 3 m. Take E = 27 GPa.	3	CO3
3C	A simply supported beam of span 3m is subjected to a concentrated load 90 kN at mid-span. Taking EI = 12000 kN-m^2, obtain the maximum slope and maximum deflection in the beam using Conjugate beam method.	5	CO4
4A	A three hinged parabolic arch of 20 m span and central rise 5 m, carries an UDL of 10 kN/m throughout the span. The vertical reaction is 100 kN and horizontal thrust is 100 kN at the both supports. Calculate the normal thrust and radial shear at quarter span from right support.	2	CO3

4B	A circular bar of 20 mm diameter is subjected to direct axial tensile load of 20 kN. Find: a) maximum shear stress in the bar, b) plane of maximum shear, c) normal stress on the plane where shear is maximum.	3	CO2
4C	Determine vertical displacement at mid span of the beam AB as shown in the Figure, using Unit load method. 	5	CO5
5A	Determine total strain energy stored in a cantilever beam of span 3m subjected to downward uniformly distributed load 5 kN/m throughout the span. Assume uniform EI.	2	CO5
5B	Figure shows a cantilever bent ABC, fixed at A and free at C. Determine the horizontal displacement of the joint C using Unit Load Method.. 	3	CO5
5C	Determine vertical displacement at 2 m from left support of the beam AB as shown in the Figure using Castigliano's theorem. Assume uniform EI. 	5	CO5