

MANIPAL INSTITUTE OF TECHNOLOGY

A Constituent Institution of Manipal University

## III SEMESTER B.TECH. (CIVIL ENGINEERING) END SEMESTER EXAMINATIONS, NOV/DEC 2016

## SUBJECT: MECHANICS OF STRUCTURES [CIE 2102] REVISED CREDIT SYSTEM (25/11/2016)

Time: 3 Hours

MAX. MARKS: 50

## Instructions to Candidates:

✤ Answer ALL the questions.

✤ Missing data may be suitable assumed.

1A.	Determine the forces in members of the truss shown in Figure Q1A.	6	CO1
1B.	A simple supported beam 100mm x 200mm a point load 'W' at midspan. If the permissible stresses in flexure and shear are 120MPa and 6Mpa respectively, determine the span length	4	CO1
2A.	A shear force of 40kN and bending moment of 20kNm act at a cross section of rectangular cantilever beam 100mm wide and 200mm deep. Calculate the values of Major and Minor principal stress at a point 20mm above the bottom most fibre of the cross section.	5	CO2
2B.	<ul> <li>A solid brass shaft of 100mm diameter is to be replaced by a tubular steel shaft of same length and external diameter 100mm in such a way that each of the two shafts will have same angle of twist per unit torsional moment over the total length. The ratio of shear modulus of steel to brass as 2.</li> <li>(i). What must be the inner diameter of the tubular shaft</li> <li>(ii). What torque can be applied to the tubular shaft, if the limiting shear stress is 50MPa?</li> </ul>	5	CO2
3A.	A tubular strut pin-jointed at both ends has outer and inner diameter as 40mm and 36mm respectively and is 2.4m long. Find the crippling load using Euler's and Rankine's formulae. For what length of the strut of this cross section does Euler's formula cease to apply? $E = 204$ GPa; Rankine's constant, $\alpha = 1/7500$ ; Crushing stress $\sigma_c = 310$ MPa; Yield stress $\sigma_y = 335$ MPa.	5	CO2
3B.	Four point loads 50kN, 70kN, 100kN and 40kN spaced at 3m, 3.5m and 2.5m respectively between consecutive loads roll over a simple girder of 45m span from left end to the right, with 40kN leading. Using Influence lines calculate the values of (i). Absolute maximum BM (ii).Absolute maximum SF.	5	CO3
4A.	Determine the slope and deflection at mid span for a simply supported beam of span 6m carrying a downward point load of 30kN at 2m from left support. $E = 204x \ 10^6 \ kN/m^2$ and 1=50x 106 mm <sup>4</sup> . Use moment area method.	5	CO5
4B.	Determine horizontal and vertical displacement of the free end C of vertical bent shown in Fig Q4B, using Castigliano's theorem.	5	CO4

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5A.	Using Macaulay's method, determine the vertical displacement at free end C of an overhanging beam shown in Figure Q5A.								5	5	CO4		
5B.	A three hinge symmetrical parabolic arch of span 32m and central rise 6m is subjected to 2 point loads 100kN and 80kN at the left and right quarter span points respectively. Find the reaction at the supports. Find bending moment, normal thrust and radial shear at 10m from left support.							5	5	CO5			





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