Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH (CIVIL) END SEMESTER EXAMINATIONS

APRIL/MAY 2019

SUBJECT: STRENGTH OF MATERIALS [CIE 3283]

Date of Exam: / /2019 Time of Exam: - Max. Marks: 50

Instructions to Candidates:

Answer ALL the questions & missing data may be suitably assumed

1A.	State any four assumptions made in simple bending theory	2	CO1
1 B .	Determine the section modulus of a T-beam having flange in compression zone with dimension 100 mm \times 20 mm and web dimension 20 mm \times 100 mm. The beam is subjected to sagging bending moment.	3	CO1
1C.	A simply supported beam of 1.5 m of size 15 mm \times 200 mm fails if a concentrated load of 425 N is applied at its mid-span. What is the maximum uniformly distributed load which can be applied on a cantilever beam of same material of 50 mm \times 110 mm with 2 long before it fails?	5	C01
2A.	A simply supported beam of span 4 m has rectangular section 200 mm \times 250 mm. If shear force at a section of the beam is 5500 N, find the shear stress at a distance of 100 mm above the neutral axis.	3	CO1
2 B .	Define, (i) Slope (ii) Deflection in beams.	2	CO2
2C.	Determine the deflection under loads for simply supported beam ACDB with AC = 2 m, CD = 3 m and DB = 3 m carrying point loads of 200 kN and 120 kN acting at C and D respectively. Take EI= 2.1×10^{15} N-mm ² , use Macaulay's method.	5	CO2
3A.	Derive the torsion equation for a circular shaft with usual notation.	5	CO3
3B.	Explain, (i) Resultant stress in compound bar (ii) Principal stress	2	CO4
3C.	A square element of a material subjected to a state of simple shear. Show that, in this element diagonal planes are principal planes and the magnitude of principal stress is equal to magnitude of shear stress.	3	CO4
4A.	A thin cylinder of internal diameter 1 m is subjected to a fluid pressure of 1 MPa. Determine the safe minimum thickness of cylinder if the maximum allowable stress under tension is 50 MPa and maximum allowable shear stress is 10 MPa.	5	CO4
4 B .	Find the thickness of metal necessary for a thick cylinder of internal diameter 150 mm to withstand an internal pressure of 50 MPa. The maximum stress in the section is not to exceed 150 MPa.	5	CO4
5A.	List out the effective length of the columns corresponding to different end conditions.	2	CO5
5B.	State the assumptions made in Euler's theory of long column.	3	CO5
5C.	A hollow cast iron column 130 mm external diameter and 80 mm internal diameter is 3 m long with ends are held in position and restrained against rotation. Calculate the safe load that the column can carry using (i) Euler formula (ii) Rankine's formula. Assume a = $1/1600$, E = 90GPa, factor of safety = 4 and F _c = 550 MPa.	5	CO5