Q. Code: 356121

Reg. No. | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATIONS, DEC 2019

Third Semester

CE16301 – STRENGTH OF MATERIALS – I

(Civil Engineering)

(Regulation 2016)

Time: Three Hours **Maximum : 100 Marks**

Answer **ALL** questions

PART A - (10 X 2 = 20 Marks)

		CO	RBT
1.	If the modulus of elasticity of a material is $2x10^5$ N/mm^2 and m=3, the modulus of rigidity is -------.	1	U
2.	A rod is 2 m long at 10 ^{0}C. If the expansion is prevented, find the stress in the material when the temperature is raised to 80 ^{0}C. Take E=1*10^5 N/mm^2 and α=0.000012/ ^{0}C.	1	U
3.	A simply supported beam of span 6 m carries a concentrated load of 12 kN at 2 m from the left support. What is the maximum shear force?	2	U
4.	A circular section is subjected to a transverse shear force. Sketch the shape of shear stress distribution.	2	U
5.	In what type of problems the moment area method principles are great convenient to use?	3	U
6.	A cantilever beam of span 'L' is subjected to a clockwise couple M at the free end. Draw conjugate beam and find the slope at the free end.	3	AP
7.	Write down the equation for maximum shear stress of a solid circular section in diameter 'D'when subjected to torque'T'.	4	R
8.	The angle of helix of a spring is α, write down equations for torque and moment under an axial load 'W' at the free end.	4	U
9.	Write the expression for longitudinal stress in a thin cylindrical vessel due to internal pressure 'p'	5	R
10.	What is a deficient frame?	5	R

PART B - (5 X16 = 80 Marks)

11.	(a)	A composite bar of 4000 mm length is made up of two bars, aluminium and steel. The aluminium bar is of 1000 mm length and 600 mm^2 in cross section and steel bar is of 3000 mm length and 300 mm^2 in cross section. The ends of the composite bar are held between rigid supports. Determine the stresses in the materials and reactions at the supports when the temperature rises by 20^0C. Take $E_{aluminium}$= 70 GN/m^2, E_{steel}=200 GN/m^2, $\alpha_{aluminium}$ = $11x10^{-6}/^oC$, α_{steel} = $12x10^{-6}/^oC$.	**(16)**	**1**	**AP**
		(OR)			
	(b)	A circular rod of 100 mm diameter and 500 mm length is subjected to a tensile force of 100 kN. Determine modulus of rigidity, bulk modulus and change in volume if Poisson's ratio=0.3 and Young's modulus E=$2x10^5$ N/mm^2.	**(16)**	**1**	**AP**
12.	(a)	Draw shear force and bending moment diagrams for a 6-m long simply supported beam that carries a point load of 12 kN and a clockwise couple of 2 kNm at 2 m from the left end.	**(16)**	**2**	**AN**
		(OR)			
	(b)	A cast iron beam has an I-section with the top flange 80 mm x 40 mm, the web 120 mm x 20 mm and the bottom flange 160 mm x 40 mm. If tensile stress is not to exceed 30 N/mm^2 and a compressive stress 90 N/mm^2, what is the maximum uniformly distributed load the beam can carry over a simply supported span of 6 m if the larger flange is in tension?	**(16)**	**2**	**AN**
13.	(a)	A beam AB is 6 m long and has a moment of inertia of 450 x 10^6 mm^4. It is supported at A and B and carries a uniformly distributed load of 10 kN/m from 1 m to 4 m from the left end A. Calculate (i) slope at A, (ii) deflection at mid span, and (iii) maximum deflection. Take E=200 kN/mm^2.	**(16)**	**3**	**AN**
		(OR)			

	(b)	A simply supported beam AB of span 10 m carries a point load of 15 kN, 8 m from end A. The value of moment of inertia of the left half of the beam is 4I and that of right half is I. Find (i) slope at end A, (ii) deflection at the mid-span and (iii) maximum deflection. $I = 8 \times 10^5$ mm^4 and $E = 200 \times 10^6$ kN/m^2. Use conjugate beam method.	**(16)**	**3**	**AN**
14.	(a)	Determine the diameter of a solid shaft which will transmit 112 kW at 200 rpm. Also, determine the length of the shaft if the twist must not exceed 1.5^0 over the entire length. The maximum shear stress is limited to 50 N/mm^2. Take the modulus of rigidity = 8×10^4 N/mm^2.	**(16)**	**4**	**AP**
		(OR)			
	(b)	A close- coiled helical spring has a stiffness of 5 N/mm. Its length when fully comprised with adjacent coils touching each other is 40 cm. The modulus of rigidity of the material of the spring = 0.8×10^5 N/mm^2. Determine the wire diameter and mean coil diameter if their ratio is 1/10. What is the corresponding maximum shear stress in the spring?	**(16)**	**4**	**AP**
15.	(a)	At a point in a strained material, there is a horizontal tensile stress of 100 N/mm^2 and an unknown vertical stress. There is also a shear stress of 30 N/mm^2 on this plane inclined at 30^0 to the vertical, and the normal stress is found to be 90 N/mm^2 tensile. Find the unknown vertical stress and also principal stresses and maximum shear stress.	**(16)**	**5**	**AP**
		(OR)			
	(b)	Determine the magnitude and nature of forces in the members BC, BF, CE and FE of the frame shown in Figure.	**(16)**	**5**	**AN**