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

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2023

Third Semester

CE18301 – STRENGTH OF MATERIALS I

(Civil Engineering)

(Regulation 2018/2018A)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Solve problems applying the fundamental concepts of stress, strain, principal stresses and principal planes in mechanics of solids and structures.	3
CO 2	Analyse determinate beams and determine shear forces, bending moments and stresses in beams.	3
CO 3	Determine slope and deflection of determinate beams using appropriate method.	3
CO 4	Design shafts to transmit required power and also design helical springs for its maximum energy storage capacities.	3
CO 5	Analyze and determine the forces in the members of pin jointed plane trusses.	3

PART- A (10 x 2 = 20 Marks)

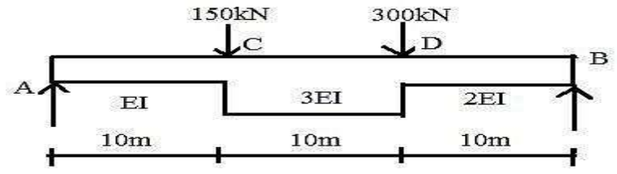
(Answer all Questions)

		CO	RBT LEVEL
1.	Define thermal stress and strain.	1	1
2.	Differentiate Ultimate Stress and Yield stress	1	2
3.	List the assumptions used to in theory of simple bending	2	2
4.	What are Flitched Beams?	2	1
5.	Distinguish between statically determinate and indeterminate beams.	3	2
6.	When is conjugate beam method preferred?	3	2
7.	Give any two functions of spring.	4	2
8.	For a circular shaft of diameter d subjected to torque T, what is the maximum value of the shear stress?	4	3
9.	Differentiate a frame and truss.	5	2
10.	State the advantages of method of section over method of joints.	5	2

PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11. (a)	A bar of 25 mm diameter is tested in tension. It is observed that when a load of 60 kN is applied, the extension measured over a gauge length of 200 mm is 0.12 mm and contraction in diameter is 0.0045 mm. Examine the Poisson's ratio and elastic constants E, G, K.	(14)	1	3
	(OR)			
(b)	A specimen of steel 20 mm diameter with a gauge length of 200 mm is tested to destruction. It has an extension of 0.25 mm under a load of 80 kN and the load at elastic limit is 102 kN. The maximum load is 130 kN. The total extension at fracture is 56 mm and diameter at neck is 15 mm. Find (i) The stress at elastic limit. (ii) Young's modulus. (iii) Percentage elongation. (iv) Percentage reduction in area. (v) Ultimate tensile stress.	(14)	1	3
12. (a)	A cantilever beam of 2 m long carries a uniformly distributed load of 1.5 kN/m over a length of 1.6 m from the free end. Draw shear force and bending moment diagrams for the beam.	(14)	2	3
	(OR)			
(b)	Derive an expression for shear force and bending moment of a simply supported beam carrying a UDL of w/metre length throughout its span with neat sketch.	(14)	2	3
13. (a)	A steel cantilever beam of 6 m long carries 2 point loads 15 kN at the free end and 25 kN at the distance of 2.5 m from the free end. Determine the slope at free end & also deflection at free end. $I = 1.3 \times 10^8$ mm^4. $E = 2 \times 10^5$ N/mm^2	(14)	3	3
	(OR)			

(b) Using conjugate beam method, obtain the slope and deflections at A, B, C and D of the beam shown in figure. Take E = 200 GPa and I = $2x10^{-2}$ m^4 **(14) 3 3**



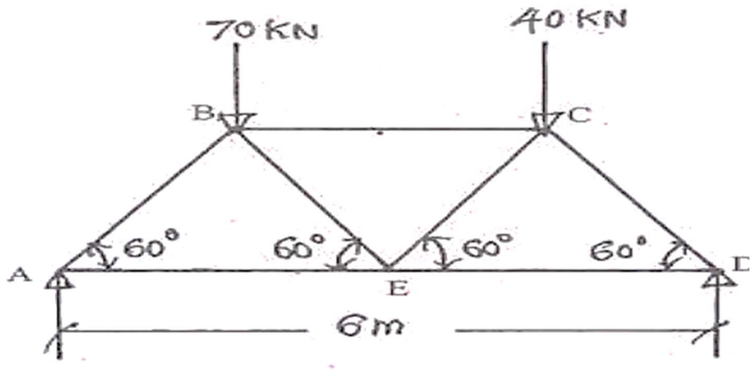
14. (a) A solid steel shaft is subjected to a torque of 45 kNm. If the angle of twist is 0.5^0 per meter length of the shaft and the shear stress is not to be allowed to exceed 90MN/m^2. & C= 80 GN/m^2. Evaluate **(14) 4 3**

a) Suitable diameter for the shaft
b) Final maximum shear stress
c) Angle of twist
d) Maximum shear strain in the shaft

(OR)

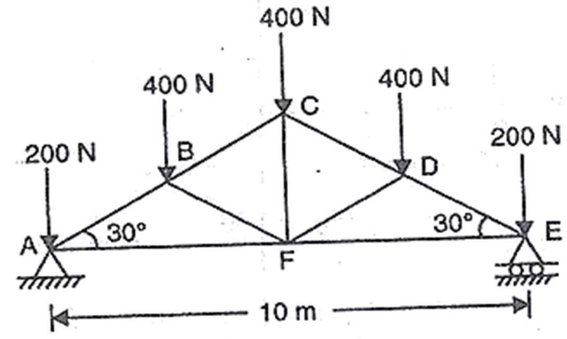
(b) A helical spring in which mean diameter of the coil is 8 times the wire diameter is to be designed to observe 0.2 k N of energy with an extension of 100 mm. The maximum shear stress is not to exceed 125 N/mm^2. Determine the mean diameter of wire and diameter of springs and number of turns also find the load with an extension of 40 mm could be produced in the spring assume G = 84 k N/mm^2. **(14) 4 3**

15. (a) Analyze and predict the forces in all members of the truss shown in figure by using any one analytical methods. **(14) 5 3**



(OR)

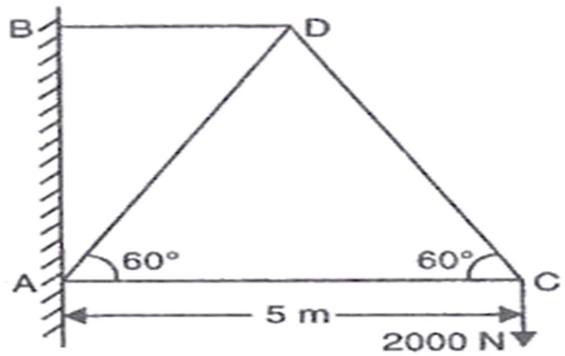
(b) Analyze and predict the forces in all members of the truss shown in figure by method of sections **(14) 5 3**



PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	A truss loaded shown in fig. Analyze and find the reaction and forces in the members by using method of joints	**(10)**	5	3



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