Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

THIRD SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

Course Code: CE201

Course Name: MECHANICS OF SOLIDS (CE)

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks

			Marks
1	a)	Differentiate normal and shear stress with an example.	(5)
	b)	Define elastic constants. Derive any one relation between them.	(10)
2	a)	Derive the expression for elongation of a bar due to its own weight.	(5)
	b)	A bar of 20 mm diameter is subjected to a pull of 50 kN. The measured extension on gauge length of 250 mm is 0.12 mm and change in diameter is 0.00375 mm. Calculate: i) Young's modulus ii) Poisson's ratio iii) Bulk modulus	(6)
	c)	A steel rod tapers uniformly from 20 cm diameter at one end to 5 cm diameter at the other in a length of 75 cm. How much will it stretch under an axial pull of 5 kN. Given $E = 2 \times 10^5$ kN/cm^2.	(4)
3	a)	Define strain energy and complimentary strain energy. Derive an expression for strain energy in a body subjected to axial stress.	(7)
	b)	A steel bar is placed between two copper bars each having the same area and length as the steel bar at 15°C. At this stage they are rigidly connected together at both the ends. When the temperature is raised to 315°C, the length of the bars increases by 1.50 mm. Determine the original length and the final stresses in the bars. Take $E_s = 2.1 \times 10^5$ N/mm^2, $E_c = 1 \times 10^5$ N/mm^2, $\alpha_s = 0.000012$ per °C, $\alpha_c = 0.0000175$ per °C	(8)

PART B

Answer any two full questions, each carries 15 marks

4	a)	Establish relation between load, shear force and bending moment	(5)
	b)	Construct shear force diagram and bending moment diagrams for a beam ABE, 3L/2 m long, which is supported at A and B, 'L' m long. The beam carries a concentrated load of 2W at L/4 distance from left support A, and point load W/2 at E. It also carries an upward point load of W at a distance of L/4 from support B.	(10)
5		What is pure bending? Derive an expression for bending stress in beams, stating the assumptions.	(15)
6		Determine and draw the shear stress variation along the depth of an I section beam having a uniform thickness of 10 mm, for the web and flanges. The total height of the section is 200 mm and overall width of each flange is 100 mm. The shear force is 250 kN.	(15)

PART C

Answer any two full questions, each carries 20 marks

7 a) The stresses at a point in a strained material are 50 MPa tensile and 20 MPa tensile, on two mutually perpendicular planes along with shear stress of 15 MPa. Find the principal stresses and planes on which they act. Also find the maximum shear stress and its plane. (8)

b) A thick spherical shell of inside diameter 180 mm is subjected to an internal fluid pressure of 50 MPa. Find the thickness of the shell, if the maximum permissible tensile stress in the shell is 190 MPa. (8)

c) State the differences between close coiled and open coiled spring. (4)

8 a) A hollow shaft is to transmit 300 kW power at 80 rpm. If the shear stress is not to exceed 60N/mm^2 and the diameter ratio is 0.6, find the external and internal diameters assuming the maximum torque is 1.4 times the mean. (10)

b) Derive an expression for slope and deflection of a simply supported beam with a uniformly distributed load of intensity 'w' per meter throughout the span. (10)

9 a) How can you find slope and deflection in beams using moment area method? (6)

b) Define effective length of a column. Give the effective lengths for various end conditions. (6)

c) Calculate the safe compressive load on a hollow cast iron column with one end rigidly fixed and other hinged, of 15 cm external diameter, 10 cm internal diameter and 10 m in length. Use Euler's formula with a factor of safety 5 and E = 95 kN/mm^2. (8)

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