Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FOURTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019

Course Code: ME202

Course Name: ADVANCED MECHANICS OF SOLIDS (ME)

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any three full questions, each carries 10marks. Marks

1 a) Explain stress at a point in rectangular shaped member? (4)

b) Stress at a point is given by $\begin{bmatrix} 1 & 2 & 1 \\ 2 & -2 & -3 \\ 1 & -3 & 4 \end{bmatrix}$ k Pa. Determine principal stresses? (6)

2 From fundamentals derive the equilibrium equation in rectangular coordinate for two-dimensional system? (10)

3 A cantilever beam 4 m long having rectangular cross section of 15 cm height and 2 cm thick. This is loaded at its free end. The load at free end is 100 kN. Find maximum bending stress and maximum shear stress in the cantilever? (10)

4 a) Explain St. Venant's end effect with an example? (6)

b) Explain uniqueness theorem? (4)

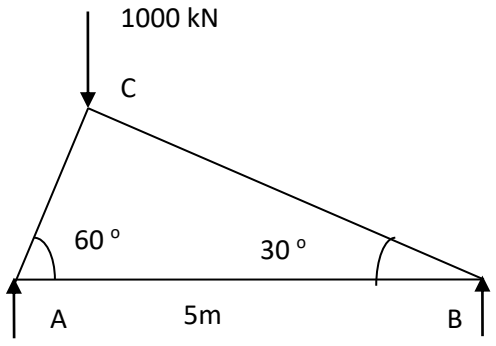
PART B

Answer any three full questions, each carries 10marks.

5 a) Sketch a 2-Dimensional element in polar coordinate (r, Θ) system and show all stresses on it? (4)

b) Derive the equilibrium equation in 2-Dimensional polar coordinate system? (6)

6 Find the downward displacement at the point of load applied for the given figure? Cross section of members 2 cm ^{2} and Young's modulus 200 GPa. (10)



7		Derive the expression for various stresses developed in thick cylinder subjected to internal pressure only?	(10)
8		Derive the expression for stress developed in curved beam subjected to bending moment 'M'?	(10)

PART C

Answer any four full questions, each carries 10marks.

9		State and prove Castiglione's First and Second theorems	(10)
10		A cantilever beam supports a uniformly distributed load of 'w' per unit length and a concentrated load 'P' at the free end in downward direction .Take the length as 'L'. Determine the downward deflection at free end?	(10)
11		A hollow aluminium section having rectangular cross section. The thickness of the section is 6 mm. Outer sides of the section having width 100 mm and height 56 mm. Find the twisting moment taken by the section and angle of twist? Modulus of rigidity is given by 28 GPa .The maximum shear stress induced is 35 N /mm^2.	(10)
12	a)	Derive the equilibrium equation based on the membrane stress analogy?	(5)
	b)	Find the maximum shear stress induced in an elliptical shaft having semi major axis 15 cm and semi minor axis 7.5 cm? Applied torque is 1500 Nm.	(5)
13	a)	State and explain virtual work principle?	(5)
	b)	State and explain minimum potential energy theorem?	(5)
14		Derive expressions for (i) Angle of twist per unit length, (ii) Torsional rigidity and (iii) Stresses, for elliptical cross section under torsion, by Prandtl's method?	(10)

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