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Total No.of Pages:02

B.Tech Examination-2014
Machanics of Materials (AE-201)
Paper ID-A0701

TIME:3 HRS **MM:60**

	NOTE: QUESTION PAPER CONSISTS OF THREE SECTIONS SECTION A, SECTION B, SECTION C (Each of 20 marks) Attempt **all** questions from Section A. Attempt any **four** questions from Section B. Attempt any **two** questions from Section C.	
	Section A **(10 x 2 = 20)**	
1(i)	Giving the mathematical formula, define the modulus of elasticity.	
(ii)	Why is a spherical shaped pressure vessel preferable over cylindrical shapes?	
(iii)	Define 'Pure Bending' of a beam.	
(iv)	Draw (only draw) the variation of shear stress in a circular shaft under torsion.	
(v)	Defining all the variables, give the mathematical form of Rankine Formula used in columns.	
(vi)	What are the most common practical applications of a leaf spring?	
(vii)	What is the difference between the closed coiled and open coiled helical springs?	
(viii)	What is the difference between a strain energy and proof resilience?	
(ix)	Define column.	
(x)	Write the expression for Castigiliano's theorem.	
	Section B **(4 x 5 = 20)**	
2.	Draw and explain the stress-strain curve for ductile materials.	
3.	A cylinder is 4 m long, 0.9 m in diameter and 14 mm thick at atmospheric pressure. Calculate the dimensions when subjected to an internal pressure of 2 MPa. What is then the maximum shear stress in the shell?	
4.	Derive an expression of buckling load for column with one end fixed and the other end hinged.	
5.	A hollow shaft of diameter ratio 3/5 is required to transmit 800kW at 120rpm, the maximum torque being 25% greater than the mean. The shear stress in not to exceed 65 MPa and the twist in a length of 3m is not to exceed 1.4 degrees. Calculate the minimum external diameter satisfying these conditions.	
6.	Assuming all the parameters, derive an expression for strain energy due to bending for a beam of length, *l*.	

	Section C (2 x 10 = 20)	
7.	A vertical tie rod rigidly fixed at the top end consists of a steel rod 3 m long and 21 mm diameter is encased throughout in a brass tube 21 mm internal diameter and 30 mm external diameter. The rod and the casing are fixed together at both ends. The compound bar is suddenly loaded in tension by a weight of 10kN falling freely through 3 mm before being arrested by the tie. Calculate the maximum stresses in steel and brass. Take the Young Modulus for steel and brass as 200 GPa and 100 GPa respectively.	
8.	Calculate the spring constant and total elongation of two springs which are connected in series. One spring having 16 turns of 1mm wire radius and 22 mm mean diameter is connected to other spring having 12 turns of 2 mm wire diameter and 13 mm mean diameter. Also calculate the safe axial load, if the maximum stress in both springs is less than 400 N/mm^2. Take $G = 8 \times 10^5$ N/mm^2.	
9.	A beam 8.5 m long rests on supports 5 m apart. The right hand end overhanging its support by 2m and left hand end by 1.5 m. The beam carries a uniformly distributed load 50 kN/m run between the supports only. The beam also carries a point load of 60 kN at the extreme right hand end, and a point load of 40kN at the left hand end. Construct the shear force and bending moment diagrams stating there on all the important values of shear force and bending moment. State the position of the points of inflexion on the beam.	