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Question PaperCode:94704

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2021

Fourth Semester

Mechanical Engineering

19UME404– MECHANICS OF MATERIALS

(Regulation2019)

Duration: Three hours Maximum:100 Marks

PARTA-(10x2= 20Marks)

(Answer any Ten of the following questions)

1.	Explain the Hooke's law.	CO1 U
2.	Explain the term Poisson's ratio.	CO1 U
3.	Explain the term Stiffness.	CO1 U
4.	Explain what is uniformly distributed load?	CO1 U
5.	Explain the term shear force and bending moment.	CO1 U
6.	Classify the types of beams.	CO1 U
7.	Explain the term Torsion.	CO1 U
8.	Show the equation for maximum shear stress of a solid circular section in diameter D when subjected to torque T in a solid shaft.	CO1 U
9.	Demonstrate the expression for torque transmitted by hollow shaft.	CO1 U
10.	Illustrate Euler's formula for buckling load.	CO1 U
11.	Explain what is slenderness ratio?	CO1 U
12.	What is effective length of a column?	CO1 U
13.	Demonstrate Hoop stress and longitudinal stress.	CO1 U
14.	Explain what is the ratio of hoop stress to the longitudinal stress?	CO1 U
15.	A spherical shell of 1m diameter is subjected to an internal pressure of 0.5 N/mm^2. Find the thickness of the shell if the allowable stress in the material of the shell is 75 N/mm^2.	CO1 U

PART -- B (5 x 16 = 80 Marks)

16..	(a) Three bar made of copper, Zinc and aluminum are equal length and have cross sections 500, 750 and 1000 mm^2 respectively. They are rigidly connected at their ends. If this compound member is subjected to a longitudinal pull of 250 kN. Estimate the proportional of the load carried on each rod and the induced stress. Take the Young's modulus for copper = 1.3 x $10^5 N/mm^2$, for zinc = 1 x $10^5 N/mm^2$ and for aluminum = 0.8 x $10^5 N/mm^2$.	CO 2 - App	(16)
	Or		
	(b) A bar of 30 mm diameter is subjected to a pull of 60 kN. The measured extension on gauge length of 200 mm is 0.1 mm and the change in diameter is 0.0039 mm. Calculate the Young's Modulus and Poisson's ratio.	CO 2 - App	(16)
17.	(a) Draw the shear force diagram of a cantilever beam of length 4 m carrying a load of 5kN at his free end.	CO 2 - App	(16)
	Or		
	(b) Draw BM diagram for the overhanging beam of length 6 m carries a UDL of 20 KN/m over its whole length. The distance between two supports is 5 m. The beam over hangs at a distance of distance of 1 m from the right support. Locate the point of contra flexure.	CO 2 - App	(16)
18.	(a) A composite shaft consists of copper rod of 25 mm diameter enclosed in a steel tube of external diameter 45 mm and 5 mm thick. The shaft is required to transmit a torque of 1100 N-m. Determine the torque transmitted by each shaft.	CO 2 - App	(16)
	Or		
	(b) A steel shaft A, B, C and D, having a length of 2.4 m consists of three lengths having different sections as follows. AB is hollow having OD and ID as 80mm, 50mm respectively and BC and CD are solid. BC having a diameter of 80mm and CD having a diameter of 70mm. If the angle of twist is the same for each section determine their length.	CO 2 - App	(16)

19.	(a) A steel 8 m long and 80mm in diameter is used a column determine the crippling load by using Euler's formula when the column is used in any three end conditions. $E = 2.1 \times 10^5$ N/mm^2.	CO 2 - App	(16)
	Or		
	(b) A hollow alloy tube 7m long with outer and inner diameter 40mm and 25 mm respectively was found to be extended by 6.4mm under a tensile load of 80kN. Find the buckling load of the tube when the tube is used as a column with both the ends pinned. Also find the safe compressive load for the tube with FoS as 4.	CO 2 - App	(16)
20.	(a) A cylindrical shell 1 m internal diameter and 15 mm wall thickness is 3 long. Calculate the maximum intensity stress induced and also the changes in the dimensions of the shell if it is subjected to an internal pressure of 1.5 N/mm2. Take E = 2.04 X 105 N/mm2 and 1/m = 0.3.	CO 2 - App	(16)
	Or		
	(b) A thin spherical shell 1.5m in diameter, with its wall of 1.25 cm thickness is filled with the fluid at atmospheric pressure. What intensity of pressure will be developed in it if 160 cm^3 more of fluid is pumped into it? Also calculate the hoop stress at that pressure and increase in diameter	CO 2 - App	(16)