(Please write your Exam Roll No.) *Exam Roll No. .....*

END TERM EXAMINATION

THIRD SEMESTER [B.TECH] NOVEMBER-DECEMBER -2017

Paper Code: ETAT-203 *Subject: Strength of Material*

Time: 3 Hours *Maximum Marks: 75*

Note: Attempt any five questions including Q. no.1 which is compulsory. Assume suitable missing data if any.

Q1 Attempt **any five** questions. **(5x5)**

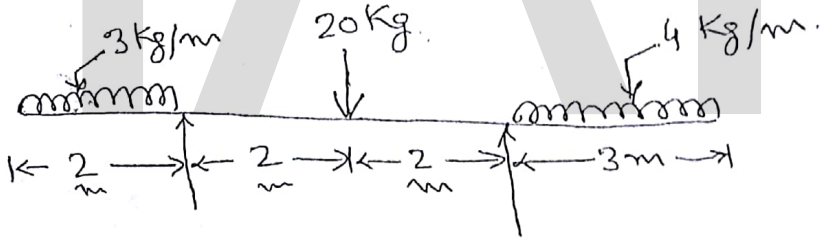
(a) What are different types of strains? Describe briefly.
(b) What is relation between young's modulus and modulus of rigidity? Prove.
(c) What is principle of super position? Explain with example.
(d) Write bending equation. Name all the variables along with their respective units.
(e) What are different theories of failures? Explain any one with example.
(f) Explain Lame's Theorem. Also state the assumption made for it.

Q2 A steel rod of 25 mm dia passes through a brass tube of 25 mm inner dia and 35 mm outer dia. The nut on the rod is tightened until a stress of 10 MPa is developed in the rod. The temperature of the tube is then raised by 60°C. What are the final stresses in the rod and the tube? Take **(12.5)**

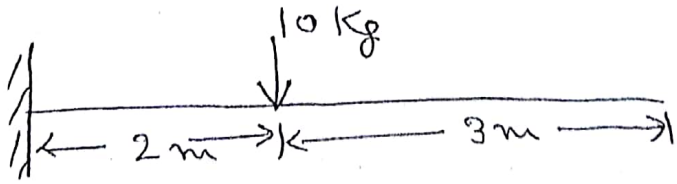
E_s = 200 GPa and x_s = 0.000017/°C
E_b = 80 GPa and x_b = 0.00019 /°C

Q3 Calculate the change in volume of a 10 cm dia of solid steel sphere when it is immersed to a depth of 1000 m in sea water. Unit weight of sea water is 0.01025 N/cm³. The modulus of elasticity and the rigidity modulus of steel are 200 GPa and 80 Gpa respectively. **(12.5)**

Q4 Draw S.F. and B.M. diagram. Determine maximum bending moment. Locate the point of inflextion. **(12.5)**



Q5 (a) What is principle of superposition? **(5)**
(b) Calculate slope and deflection for the given beam using moment area method. **(7.5)**



Q6 A material is subjected to two mutually perpendicular linear strains together with a shear strain. One of the linear strain is 0.000025 (tensile).Using Mohr's circle. Determine the magnitude of the other linear strain and the shear strain, if the principle strains are 0.00001 (compressive) and 0.00003 (tensile). **(12.5)**

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Q7 A flanged coupling is required for a shaft transmitting 220 kW at 240 rpm. The bolts are of 16 mm dia and are to be arranged on a circle of 250 mm dia. The working shear stress in the bolts must not exceed 60 MN/m^2. Determine the number of bolts required and the actual stress realized. **(12.5)**

Q8 (a) The dia of a cylindrical vessel are 16 cm and 24 cm. Calculate the minimum and maximum hoop stresses due to an internal pressure of 600 kN/cm^2 . **(6)**

(b) A close coiled helical spring is to be mode of 5 mm dia wire that is 2.0 m long so that it deflects by 20 mm under an axial load of 50 N. Determine mean dia of coils. Assume C = 81 GN/m^2. **(6.5)**

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