VIT
Vellore Institute of Technology

SCHOOL OF MECHANICAL ENGINEERING

Continuous Assessment Test – 1 - Fall Semester 2019-2020

Programme Name & Branch: B.Tech Mechanical Engineering

Course Name & Code: MEE2002 – Strength of materials 18BME0665

Class Number: 1149, 1828 **Faculty:** Prof. Senthilnathan N, Prof. Benedict Thomas

Slot: A1 **Exam Duration:** 90 mins **Maximum Marks:** 50

General instruction:
Use of graph sheet permitted.

Answer all questions

1. A prismatic bar of circular cross-section is loaded by a tensile force of 85kN. The length and diameter of the bar is 3.0m and 30mm respectively. It is made of aluminium with modulus of elasticity 70GPa and poisson's ratio of 1/3. Calculate the elongation, decrease in diameter and increase in volume of the bar. **(10 marks)**

2. A steel circular bar has three segments as shown in figure 1. Determine (i) total elongation of the bar (ii) the length of the middle segment to have zero elongation of the bar (iii) the diameter of the last segment to have zero elongation of the bar. Take E= 205 GPa. **(10 marks)**

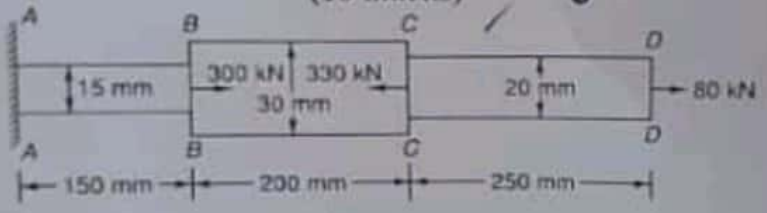

Fig. 1

3. A steel tube having an external diameter of 36 mm and an internal diameter of 30 mm has a brass rod of 20 mm diameter inside it, the two materials being joined rigidly at their ends when the ambient temperature is 18 ^{0}C. Determine the stresses in the two materials: (a) when the temperature is raised to 68 ^{0}C (b) when a compressive load of 10 kN is applied at the increased temperature. **(15 marks)**

4. A point in a strained member is subjected to stresses as shown in figure 2. Using Mohr's circle method, determine (i) the magnitude of the principal stresses and the inclination of the principal planes. (ii) the maximum shear stress and the plane on which it acts. (iii) the normal and tangential stress on a plane inclined at 30^0 with the vertical plane. **(15 marks)**

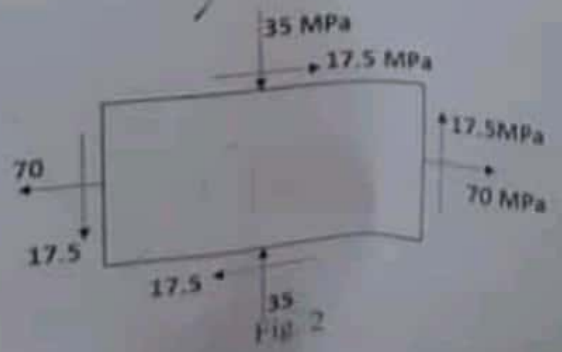

Fig. 2