BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: B.TECH **SEMESTER: III**
BRANCH: MECHANICAL/PRODUCTION **SESSION: MO/2022**

SUBJECT: ME205 STRENGTH OF MATERIALS

TIME: 2 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The total marks of the questions are 25.
2. Candidates attempt for all 25 marks.
3. Before attempting the question paper, be sure that you have got the correct question paper.
4. The missing data, if any, may be assumed suitably.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q1 At a certain point in a material $\boldsymbol{\sigma_x = S, \sigma_y = S/2}$ and $\boldsymbol{\tau_{xy} = \frac{S}{4}}$. If the maximum shear stress is not to exceed $\boldsymbol{120\ MN/m^2}$ determine S. Determine the corresponding values of the principal stresses. [5]

Q2 For Figure 1 shows a rigid bar ABC hinged at A and suspended at two points B and C by two bars BD and CE made of aluminium and steel respectively. The bar ABC carries a load of 20 kN midway between B and C. The cross-sectional area of the aluminium bar BD is 3 mm² and that of the steel bar is CE is 2 mm². Determine the load taken up by the two bars BD and CE. What are the respective stresses developed in each bar? Modulus of elasticity of aluminuim E_{Al}= 70 kN/mm². Modulus of elasticity of Steel E_s= 200 kN/mm². [5]

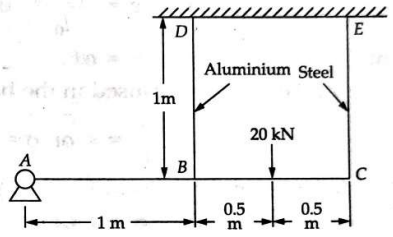

Figure 1

Q3 Draw the shear force and bending moment diagrams for the simply supported beam shown loaded in Figure 2. Clearly mark the position of the maximum bending moment and determine its value. [5]

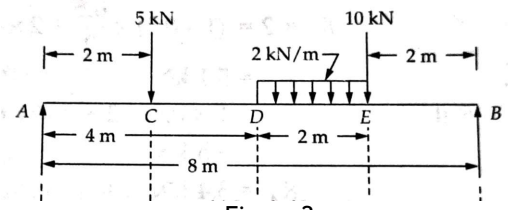

Figure 2

Q4 Derive the complete expression for the Bending stresses in the Beam [5]

Q5 Determine the distribution of shear stress of a rectangular beam having width B and Height H taking F as Shear force. [5]

:::::: 28/09/2022 ::::::M