

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATIONS-2022

B.Tech-III Semester (Civil)

COURSE CODE (CREDITS): 18B11CE315 (3)

MAX. MARKS: 25

COURSE NAME: ENGINEERING MECHANICS

COURSE INSTRUCTORS: Dr. Saurav

MAX. TIME: 1.5 Hr

*Note: All questions are compulsory. Marks are indicated against each question in square brackets.*

Q1. A steel rod 50mm in diameter and 2.5m long is subjected to a pull of 100kN. To what length the rod should be bored centrally having diameter 25mm so that the total extension will increase by 15% under the same pull. Take  $E = 200 \text{GN/m}^2$  [5][CO1,4]

Q2. A specimen of steel 20 mm diameter with a gauge length of 200 mm is tested to destruction. It has an extension of 0.25 mm under a load of 80 kN and the load at elastic limit is 102 kN. The maximum load is 130 kN. The total extension at fracture is 56 mm and diameter at neck is 15 mm. Find [3][CO1,4]

- (i) The stress at elastic limit.
- (ii) Young's modulus.
- (iii) Percentage elongation.
- (iv) Percentage reduction in area.
- (v) Ultimate tensile stress.

Q3. A tapering rod has diameter  $D_1$  at one end and it tapers uniformly to a diameter  $D_2$  at the other end in a length  $L$  as shown in Fig 1. If the modulus of elasticity of the material is  $E$ , then find its change in length when it is subjected to an axial force  $P$ . [4][CO4]

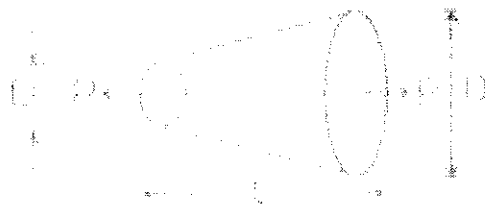


Fig. 1

Q4. An assembly as shown in the Fig 2 in which there is a gap between rigid slab and aluminum bar. If the gap is 0.20 mm then calculate the stresses in each rod when temperature of assembly is increased by  $85^\circ\text{C}$ . The slab is massless and firmly bonded to copper bars.  $A_{cu} = 500 \text{mm}^2$ ,  $A_{al} = 400 \text{mm}^2$ . Given  $E_{al} = 70 \text{GPa}$  and  $E_{cu} = 120 \text{GPa}$ .  $\alpha_{cu} = 16.8 \times 10^{-6}/^\circ\text{C}$  and  $\alpha_{al} = 23.1 \times 10^{-6}/^\circ\text{C}$ . [5][CO1,4]

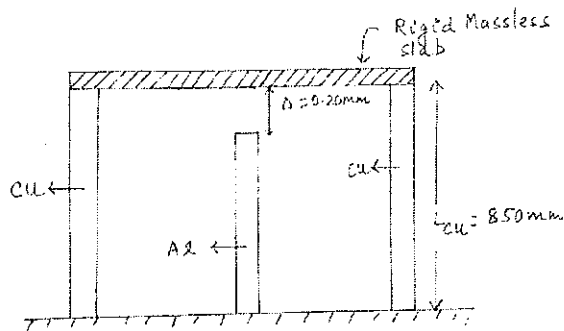


Fig. 2

Q5. Fig.3 shows as beam ABCD simply supported on a hinged support at A and at D on a roller support inclined at  $45^\circ$  with the vertical. Determine support reactions generated. Also find the resultant reaction at A. [5][CO2]

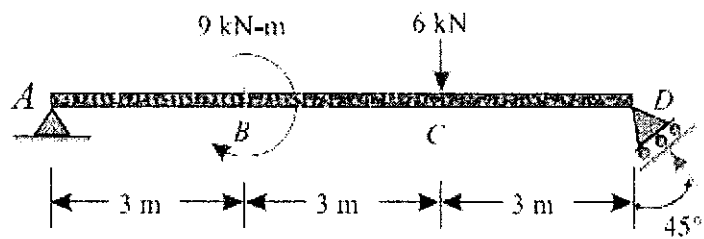


Fig. 3

Q6. For the given truss as shown in Fig. 4, find the forces in members. [3][CO2]

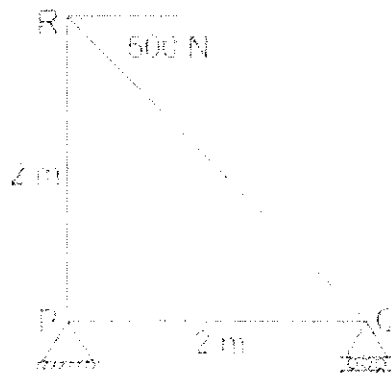


Fig. 4