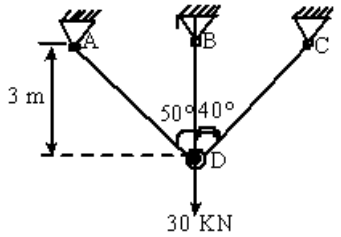
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
(Sample Question)

Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BCE	Pass Marks	24
Year / Part	I/ II	Time	3 hrs.

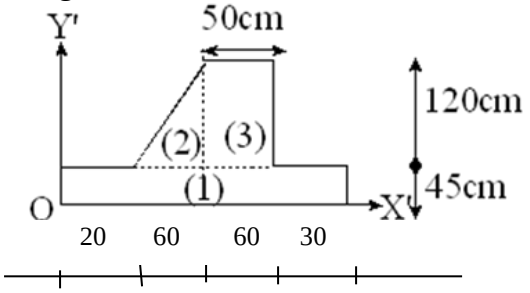
Subject: - Strength of Material (CE 151)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

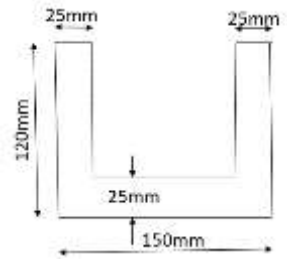
1. a) Differentiate between shearing and bearing stresses? [3]
   b) Find the forces in each members of the bar system shown in figure below. Take cross sectional area of each bar as 6 cm^2 and modulus of elasticity E as 2×10^5 N/mm^2**.** [10]



2. a) Define radius of gyration and mention its units. [2]
   b) Determine the orientation of principal axes and the principal moment of inertia of composite section shown in figure. [5]



3. a) Prove that the sum of principal stresses is equal to sum of normal stresses acting in an element. Also, show the same principal and normal stresses in the Mohr's circle. [4+3]
   b) Mention about strain rosette diagram. Explain about the various modes of failures for different materials. [2+3]
4. a) A built-up cylindrical shell of 300mm diameter, 3m long and 6mm thick is subjected to an internal pressure of $2MN/m^2$. Calculate the change in length, diameter and volume of the cylinder under that pressure if the efficiencies of the longitudinal and circumferential joints are 80% and 50% respectively. Take E = $200GN/m^2$ and Poisson's ratio (ν) = 0.30. [5]
   b) How torsional moments in parallel and series shaft combinations are transmitted? A solid circular shaft transmits 75 KW power at 200 rpm. Calculate the shaft diameter if the twist in the shaft is not to exceed 1 degree in 2 m length of shaft and shear stress is limited to 50 MN/m^2. Take G = $100GN/m^2$. [2+5]
5. A horizontal beam of the section is 3m long and is simply supported at the ends. Find the maximum uniformly distributed load it can carry if the compressive and tensile stresses must not exceed 55 N/mm^2 and 30 N/mm^2 respectively. Draw a diagram showing the variation of stress over the mid span section of the beam. [10]



6. A bar 20mm in diameter is 1.25m long. |When the bar is simply supported at its ends in a horizontal position and loaded with a concentrated load of 370N, the central deflection was found to be 9.5mm. If the bar is placed vertically and loaded axially what would be the buckling load? Find also the ratio of maximum bending stress to the buckling stress. [6]