

UNIVERSITY OF SASKATCHEWAN
DEPARTMENT OF MECHANICAL ENGINEERING
ME 450.3 FINITE ELEMENT ANALYSIS
MIDTERM EXAMINATION

Time: 1.5 hours
Open-book examination
Answer all questions

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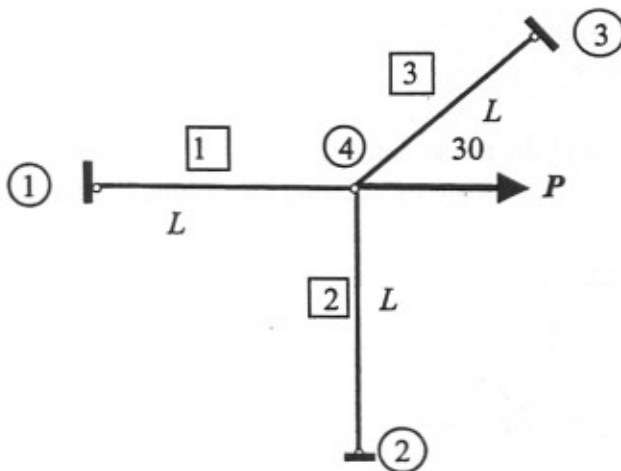
Q1. Use the bar elements to analyze the truss shown.

Determine (in terms of A , E , L and P).

- a) The displacement of node 4.
- b) The reactions at node 3.
- c) The axial force in each member.

Verify the equilibrium at node 4.

Comment on accuracy of your solution.



$AE = \text{const}$

Q2. An engineering problem is described by the differential equation in the form:

$$\frac{d}{dx} \left[(1+x) \frac{du}{dx} \right] - 6u + 4 = 0 \quad \text{where: } 0 \leq x \leq 1$$

The boundary conditions are: $\frac{du}{dx}(0) = 1$ and $u(1) = 0$;

Use the elements with linear shape functions to obtain a two-element solution.

Sketch: a) The function $u(x)$,

b) The derivative $\frac{du}{dx}(x)$.