

Ollscoil na hÉireann, Gaillimh  
National University of Ireland, Galway

**FIRST SEMESTER EXAMINATIONS 2000**

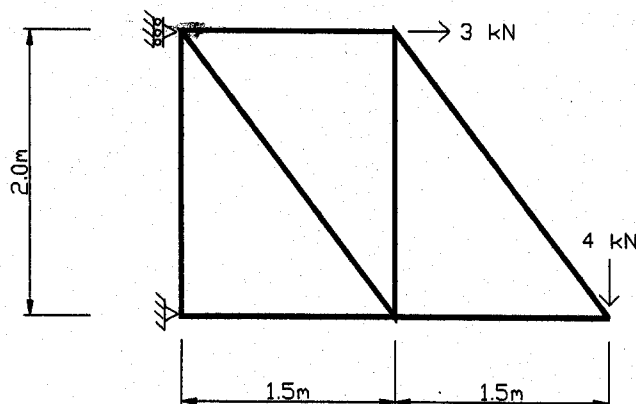
**FIRST ENVIRONMENTAL ENGINEERING EXAMINATION**

**FUNDAMENTALS OF ENVIRONMENTAL ENGINEERING**

Professor R. A. Falconer  
Professor P. E. O'Donoghue  
Dr. M. A. Hartnett

Time allowed: 2 hours  
Answer 4 questions

1. Determine the support reactions and find the forces in the members of the pin-jointed truss shown in Figure Q1. (20 marks)



**Figure Q1**

If the maximum allowable stress in the truss material is  $100\text{N/mm}^2$ , determine the minimum member size. (5 marks)

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2. (a) Discuss the role the environmental engineer plays with respect to protecting the natural environment and the skills necessary for him/her to carry out this role successfully (10 marks).

(b) Draw a schematic diagram of a typical secondary waste water treatment plant. Briefly describe the main functions of each of the processes and operations of the plant (15 marks).

3. A hydraulic cylinder with a 110 mm diameter bore is used as a hoisting mechanism in a dump truck. The cylinder is pin connected at both ends and there is also a pin connection at A. The combined mass of the dumper and its load is 25000 kg and it acts through the center of mass as shown (CM). Determine the cylinder pressure required to support the load in the positions shown in Figure Q3. (25 marks)

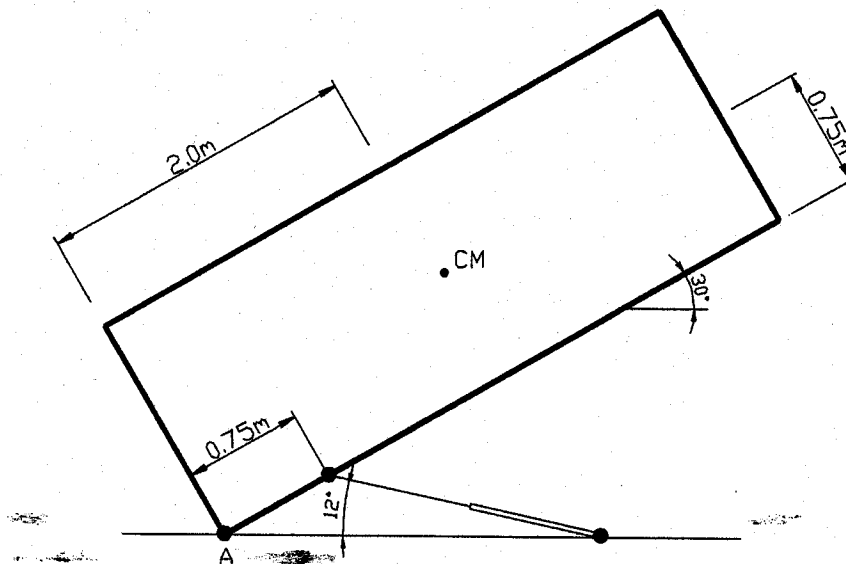


Figure Q3

4. (a) Define the terms:
- (i) Laminar flow (3 marks)
  - (ii) Turbulent flow (3 marks)
  - (iii) Steady flow (3 marks)
  - (iv) Viscosity (3 marks)
  - (v) Boundary layer (3 marks)

(b) Water is flowing through a 150 mm diameter pipe at the rate of 0.1 m<sup>3</sup>/sec. Determine the diameter reduction necessary to increase the velocity by a factor of two (10 marks).

5. "The Civil Engineer of today must have a thorough understanding of the design process" – discuss. (25 marks)