

ENG 1000 – Final Examination
April 17, 2006 1400-1600
Duration: 2 hours.
Total Marks: 100

Answer **ALL** of the following questions:

- 1) Construct an objective tree diagram for safety shoes that would be suitable footwear for an engineer visiting an industrial facility or construction site. In what instances is a hardhat advisable safety wear? (20 marks)
- 2) Discuss the use of models in engineering. Include in your answer a discussion of the principle of Occam's razor.
- 3) Write a simple algorithm to pick a winner at random, once every twenty times on average. Express your answer in computer or pseudo code. Your answer may also be in the form of a flow chart. How might such a program be used in a monitoring system to verify product quality?
- 4) An underwater structure lies an average depth of 25 m below the surface of Earth's ocean. Given that the mass of seawater is approximately 1020 kg m^{-3} , what pressure in Nm^{-2} must the structure withstand? If the structure were a cylinder of diameter 100 m and 3 m tall, what downward force would be required in order to stop it floating to the surface? Is this a problem? Make assumptions where appropriate.
- 5) Estimate the cost of a new engineering building at York. Assume that it must accommodate at least a hundred staff and faculty with lecture theatres, classrooms, extensive laboratories, parking, shopping and office space units. Assume that the cost of construction is approximately $\$2500 \text{ m}^{-2}$ and that the land lease already exists. Assuming the parking, shopping and office space is commercial, how long would it take to pay for the building through the lease of this space at $\$20 \text{ m}^{-2}$ per month.