

ENG 1000 – Mid Term Examination  
November 25, 2004 1130-1230  
Duration: 1 hour.  
Total Marks: 60

Answer **ALL** of the following questions:

- 1) A vehicle with faulty shock absorbers will tend to exhibit simple linear harmonic motion when the vehicle hits a bump in the road. This motion can be described by the equation:

$$\frac{d^2x}{dt^2} = -\omega^2 x$$

- Define each of the variables in this equation and describe what the equation means in words? What is the significance of the negative sign? Give a solution for this differential equation that describes how the motion evolves with time. What term must be added to provide some damping to the harmonic motion? (10 marks)
- 2)
- a) What is the difference between the engineering terms: objective and function? (3 marks)
  - b) What is a standard (for example, the IEEE:802 standard for wireless communications)? (3 marks)
  - c) What is a patent and to what jurisdiction would it apply? (4 marks)
- 3) Provide a situation analysis for the failure of the space shuttle Colombia (assume that the failure was caused by a detached piece of foam damaging the spacecraft's wing). (10 marks)
- 4) Construct an objectives tree for a television. (10 marks)
- 5) Provide a table of quantitative constraints for a 400-series highway. (10 marks)
- 6) Estimate the cost of a subway extension to York University. Make appropriate assumptions as required. Estimate the reduction in commuter traffic by car that you would expect from this initiative? (10 marks)