

# Cork Institute of Technology

## Higher Certificate in Engineering in Electrical Engineering—Stage 1

NFQ – Level 6

Summer 2006

### Engineering Science

(Time: 3 Hours)

#### Instructions

Answer any FIVE questions.  
All questions carry equal marks.

Examiners:

Mr. D. Polley  
Mr. M. Hennessy  
Prof. E. McQuade

$$v = u + at, \quad s = ut + \frac{1}{2} at^2, \quad v^2 = u^2 + 2as, \quad g = 9.81 \text{ ms}^{-2}$$

1.
  - (a) Convert 27.8 mV to volts and express it in *scientific notation* format. (2 marks)
  - (b) A deep-freezer display reads -16 °C . Express this in degrees Kelvin. (2 marks)
  - (c) Calculate the *momentum* of a 2 kg artillery shell moving at 50 ms<sup>-1</sup> (2 marks)
  - (d) Explain what is meant by the *significant figures* in a calculated result. (4 marks)
  - (e) Show, using an appropriate diagram, how the *refractive index*,  $n$ , of a transparent material is defined. (4 marks)
  - (f) In measurement science, what is the difference between *Accuracy* and *Precision* ? (6 marks)
  
2. A test vehicle starts from rest at point A and accelerates at 4 ms<sup>-2</sup> for 8 seconds to a point B. It then travels at constant speed for 12 seconds to a point C and then brakes gently at 2 ms<sup>-2</sup> before coming to rest at point D.
  - (i) Determine the total time taken for the whole journey from A to D. (4 marks)
  - (ii) Calculate the total distance covered from A to D using the equations of motion. (8 marks)
  - (iii) Sketch a simple velocity-time graph of the motion and verify that the *area* under the graph yields the same result for total distance as obtained in part (ii). (The graph does *not* need to be on graph paper but the axes should be marked off and labelled in a consistent fashion). (8 marks)

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