

Friday 3 May 2013 9 to 10.30

PAPER 6

Module 3P10: CONTEMPORARY ISSUES IN MANUFACTURING

Answer *all* questions.

Answers to sections *A*, *B* and *C* must appear in three separate booklets.

All questions carry the same number of marks.

The *approximate* percentage of marks allocated to each part of a question is indicated in the right margin.

There are no attachments.

STATIONERY REQUIREMENTS

8 page answer booklet x 3

Rough work paper

SPECIAL REQUIREMENTS

Engineering Data Book

CUED approved calculator allowed

**You may not start to read the
questions printed on the subsequent pages
of this question paper until instructed that
you may do so by the Invigilator**

SECTION A

1 (a) What are *greenhouse gases*? Explain briefly the connection between emissions of such gases and global warming. Why are predictions of global warming so uncertain? What are the likely consequences of an average warming of about 4 °C ? [30%]

(b) Environmental impact I is often discussed using the *I-PAT* equation. Define the terms in this equation. What are the main factors contributing to T ? What would be required to achieve a substantial reduction in T ? [30%]

(c) Environmental impact reduction depends on behavioural change, on an individual or institutional basis. Outline two ways in which such change is encouraged, using specific examples. Are the measures you describe effective? How could their effectiveness be increased? [40%]

SECTION B

2 (a) Write brief notes to explain the following.

- (i) The difference between a cell, a tissue, and an organ.
- (ii) Cytotoxicity and biocompatibility.
- (iii) Reasons for the increase in medical device development in the 20th century.
- (iv) The classification of medical devices according to risk.
- (v) The principles of bioethics.
- (vi) The premise of tissue engineering. [60%]

(b) Resorbable (erodible) polymers are commonly used in biomedical applications.

- (i) Describe what is meant by *hydrolysis*.
- (ii) List the factors that influence a material's hydrolysis rate.
- (iii) Explain the difference between bulk and surface erosion. What determines which form of hydrolysis will occur?
- (iv) What are the key factors in the utilisation of erodible polymers in drug delivery devices? How are surface and bulk eroding materials used for drug delivery? [40%]

SECTION C

3 (a) Describe the themes that were investigated during the MET industrial visits programme. [20%]

(b) Drawing on your observations during the MET visits programme across the automotive and electronics sectors, describe the typical practices related to:

(i) Operations Management

(ii) Environment and Sustainability [60%]

(c) Critically evaluate these practices and suggest ways to improve them. [20%]

END OF PAPER