

MANUFACTURING ENGINEERING TRIPOS PART IIA

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Friday 4 May 2012 9 to 10.30

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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 pad

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 manufacturer of photocopiers wishes to set a leading example in sustainability by not only improving its own triple bottom line performance but also by raising awareness of environmental sustainability matters amongst its customers.

(a) What is meant by the term *triple bottom line*? Why might tensions arise between the three elements in a manufacturing company? [15%]

(b) Discuss the most significant short-term measures the company could undertake to improve the environmental sustainability of itself and its customers. In each case, indicate the nature and scale of the impact of the measures proposed, and explain any impact on other elements of the triple bottom line. [60%]

(c) Longer-term initiatives are also planned, aimed at introducing new business models to improve triple bottom line performance over a five year period. Explain the relevance of the following to the operation of the manufacturing company, and suggest how introduction of these new business models could affect the triple bottom line performance.

(i) Product Service System;

(ii) Industrial Symbiosis. [25%]

## SECTION B

2 Resorbable polymeric materials are frequently used in medical applications, including dissolving sutures and tissue engineering.

(a) A researcher selects a resorbable co-polymer made of poly(lactic acid) and poly(glycolic acid) for a suture application.

(i) Describe the process of material break-down with time and list factors that influence this process.

(ii) Explain how the specific co-polymer composition will influence the degradation rate. [30%]

(b) Describe the differences between monofilament and multifilament sutures. Explain the advantages and disadvantages of each. [30%]

(c) Describe the basic premise of *tissue engineering*, and the specific example of skin graft tissue engineering. List the guiding principles of bioethics, and explain how these can be applied to skin graft tissue engineering. [40%]

## SECTION C

3 During the factory visits this academic year to companies in the automotive and fast moving consumer goods (FMCG) sectors, a variety of practices was observed under the following categories:

- Production processes
- Production configuration (e.g. line, cell, batch)
- Quality control systems

(a) Describe the practices observed, commenting on similarities and differences in these practices between companies and sectors. [70%]

(b) Discuss the possible influence of factors such as company size, sector and history of ownership on the practices observed. [30%]

**END OF PAPER**