MANUFACTURING ENGINEERING TRIPOS PART I

Friday 6 May 2011 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	SPECIAL REQUIREMENTS
8 page answer booklet x 3	Engineering Data Book
Rough work pad	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

Final version

SECTION A

1 The occupants of Dundrinkin, a village on the Isle of Skye in Scotland, want to put up a wind turbine to serve the community. A local pressure group, headed by a Dr MacHaggis, have started a vigorous campaign to oppose the development, using a series of articles in *Skye Lines*, the local newspaper.

Amongst other things, Dr MacHaggis has stated:

'Wind turbines are not environmentally attractive because the amount of energy consumed in their manufacture exceeds the energy which they generate in their lifetime'.

A visitor to Skye, Mrs Neep, is also reported as stating that the factory which makes these wind turbines is 'an environmental disgrace'.

Skye Lines suspects that Dr MacHaggis's information is misleading, and believes that Mrs Neep is just conducting a personal campaign against the factory. They have asked you to help them to counter these two arguments.

Provide *Skye Lines* with guidance as follows:

(a) Explain how you would conduct an *eco-audit* to allow an estimate to be made of the energy payback period of a wind turbine. Begin with a brief description of what an eco-audit is, and state clearly what the limitations of your analysis are. [60%]

(b) A reporter is going to visit the turbine manufacturing company. Provide briefing notes for what they should look out for in assessing the green credentials of the factory. [40%]

SECTION B

2 (a) You are asked to report on the current state of tissue engineering. Provide briefing notes on the following topics:

(i) the basic premise of tissue engineering and any advantages or disadvantages associated with the use of autologous cells;

(ii) the current state of the market for tissue-engineered products, with a focus on the challenges that have limited the number of commercially-available tissue engineered products available;

(iii) the specific challenges associated with the regulatory approval process for a tissue-engineered implant compared with a more traditional medical device, commenting specifically on the regulations in the USA and the UK.

[50%]

(b) A surgeon selects a multi-filament co-polymer suture made of poly(lactic acid) and poly(glycolic acid) for an abdominal internal repair.

(i) Describe how the composition of the co-polymer will influence the suture performance in the physiological environment.

(ii) Explain the rationale for selecting a multi-filament suture instead of a monofilament suture with the same diameter; use illustrations and calculations as appropriate. Note any disadvantages associated with multi-filament sutures.

[50%]

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SECTION C

3 You have been appointed Manufacturing Director for a small group of engineering companies involved in precision batch and mass mechanical engineering production. Your first task is to commission a review of the operations of each plant.

(a) Prepare a standard assessment document for each plant to complete explaining the rationale for each of the questions asked. [50%]

(b) Write guidance notes for the person completing the assessment using examples of good practice that you have observed during MET visits. [50%]

END OF PAPER