Version CYB/4

MET2
MANUFACTURING ENGINEERING TRIPOS PART IIA

Thursday 2 May 2019 9 to 10.40

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.*

*Write your candidate number **not** your name on the cover sheet.*

STATIONERY REQUIREMENTS
8 page answer booklet x 3
Rough work pad

SPECIAL REQUIREMENTS TO BE SUPPLIED FOR THIS EXAM
CUED approved calculator allowed
Engineering Data Book

10 minutes reading time is allowed for this paper at the start of the exam.

You may not start to read the questions printed on the subsequent pages of this question paper until instructed to do so.

SECTION A

1 (a) Greendox is a small company that manufactures a desktop scanner/printer for domestic and small office use. The company tries to be environmentally aware and is concerned to minimise the environmental footprint not only of its product but of all aspects of its operations. Greendox imports electronic parts from China but all other components are sourced locally. The machines are assembled in a small factory. The expected product lifetime is 10 years.

(i) Greendox has been advised to conduct an eco-audit for its product. Explain how this would be done and how it could help Greendox to minimise its environmental footprint. What would you expect the results to show? Discuss any factors in addition to the eco-audit that Greendox should consider in relation to minimising its environmental footprint. [30%]

(ii) Looking at the *manufacture* phase of the product, suggest steps Greendox should take to make the biggest saving in carbon footprint. [30%]

(iii) Looking at the *use* phase, how might Greendox minimise the carbon footprint of the product? [20%]

(b) The need for behavioural change is one of the great challenges to improving environmental performance. The two main ways in which governments seek to drive change are by *command and control*, and by *moral suasion*. Give one example of each, explaining how it is expected to drive change. In each case, discuss whether other methods could be used to achieve the same aim and assess their relative effectiveness. [20%]

SECTION B

2 (a) A company has designed a new injectable bone repair cement that can be used to fill voids in the bone after a fracture. The cement is a composite containing calcium phosphate bioceramics and a polymer.

(i) Explain why each of these material types may have been chosen for such an application. [30%]

(ii) The product is delivered to clinicians as a sterile injectable formulation within a large pre-filled glass syringe, which is packed within sealed plastic packaging. Describe four possible reasons that the company chose to sterilise the product by gamma radiation instead of sterilising by other methods. [20%]

(iii) The company wants to sell the product in both the USA and EU markets and is running clinical trials to meet regulations in both regions. Explain how the success of clinical trials is interpreted in each region. [10%]

(b) (i) What is meant by the term *medical device*? Include examples to support your explanation. [10%]

(ii) Explain the roles of water diffusion and polymer hydrolysis in controlling polymer degradation behaviour. [15%]

(iii) Healthcare is evolving alongside advances in IT and computational capabilities. Describe any two recent trends or market growth opportunities that are possible due to such advances. [15%]

SECTION C

3 (a) (i) Explain what is meant by the term *scale-up*, in the context of new or emerging technologies, using examples where appropriate. Why do firms need to consider different technical and organisational systems that may need to be scaled up? [25%]

(ii) Many national governments have invested in improving their countries' capability to scale up emerging technologies. Explain why a government would consider this an important policy. Describe two examples of major government initiatives and the reasons for these specific investments. [25%]

(b) (i) Explain what is meant by *Technology Readiness*. Include in your explanation a description of the role of the Technology Readiness Level scale. Explain why *Manufacturing Readiness* should be measured alongside Technology Readiness. [25%]

(ii) Explain what is meant by *The Valley of Death* in the context of emerging technology scale-up. Briefly describe any two industrial trends that may make the Valley of Death more challenging to overcome. [25%]

END OF PAPER