

MET3
MANUFACTURING ENGINEERING TRIPOS PART IIB

Thursday 27 April 2017

9 to 12

PAPER 2

*Answer not more than **four** questions.*

Answer each question in a separate booklet.

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 4

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.

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

1 (a) You are the Chief Technology Officer in a large multinational manufacturing firm that does not currently make significant use of Additive Manufacturing technologies. You notice that recent improvements in the performance of these technologies mean that in the near future they could provide your firm with the capability to produce an entirely new, high-value product.

(i) Describe how you could identify some of the major changes within your organisation that would have to be implemented to enable a novel technology such as Additive Manufacturing to be deployed in your firm.

[20%]

(ii) Discuss how you could identify the technical and non-technical challenges related to the development of Additive Manufacturing technologies and suggest how these challenges might be overcome.

[40%]

(b) Why and how are national governments reacting to the emergence of novel production technologies such as Additive Manufacturing?

[40%]

- 2 (a) Compare the differences between talent management in:
- (i) A venture capital-funded start-up company;
 - (ii) A medium-sized, family owned manufacturing firm; and
 - (iii) A large management consultancy firm.

[40%]

(b) A large, long-established European car manufacturing firm is attempting to respond to increasing customer demand for fully electrically powered and hybrid vehicles. The firm's senior management has decided to work with an external organisation to allow the firm to develop its capability to design, manufacture and sell electric vehicles to respond to this growing demand. They have identified a comparatively small Chinese developer and manufacturer of electrical power systems for automotive applications and are seeking to set up and manage a partnership with this firm.

- (i) Discuss people management issues that may arise during the setting up and management of this partnership.
- (ii) Discuss the leadership challenges of implementing the organisational changes required to allow the larger firm to respond to its transforming market over the medium to long term.

[60%]

3 (a) Explain what is meant by open innovation and its associated practices. [30%]

(b) Discuss how simulations, such as the City Car game, may be useful in understanding the challenges to innovation projects, and in particular the role of collaboration. [40%]

(c) Discuss why some manufacturing businesses choose to innovate more openly than others, using specific examples. [30%]

4 *Sustainable business models* are used to describe how companies manage the process of creating, delivering and capturing sustainable value.

Company A is an innovative start-up in the automotive industry which makes highly fuel-efficient and zero emissions small cars for local driving. The company has been set up not to sell the cars but to sell mobility contracts. These contracts include the fuel and therefore make more profit for the company whilst delivering a more fuel-efficient vehicle. Following the initial start-up of the business, the company has been concerned with raising investment and scaling up its operations.

Company B is a small-sized manufacturer of long-lasting furniture. The company offers a lifetime, modular product, rather than continuously upgrading and developing new products. Customers therefore do not upgrade to new versions of furniture, so sales are reduced, but the company strategy is aimed at increasing customer loyalty and word-of-mouth marketing. The company has been increasingly concerned with how to reduce the environmental impacts arising from company operations including its building, all the manufacturing processes, logistics, packaging, the use of furniture by their customers and eventually its disposal.

In this context:

- (a) For each company, describe what a sustainable business model would look like. [40%]

- (b) For each sustainable business model, describe what forms of sustainable value are created, delivered and captured. [40%]

- (c) Explain the novel features of each business model in comparison to the traditional business models of a car manufacturer and a furniture manufacturer. [20%]

5 In the context of a manufacturing business:

(a) Explain what is meant by *manufacturing strategy* and the associated decision areas. [30%]

(b) Discuss how performance measures could help to implement a manufacturing strategy, explaining the choice of three possible measures in each of the following sectors:

- (i) Passenger airliners;
- (ii) Fresh (short date life) food; and
- (iii) Steel making.

[40%]

(c) Discuss how performance measurement systems may develop in an era of greater data availability. [30%]

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6 (a) Explain the three concepts:

(i) Strategy;

(ii) Technology strategy; and

(iii) Marketing strategy.

[30%]

(b) Explain the concept of *strategic alignment* in the context of manufacturing businesses and discuss why this might be difficult to achieve in practice.

[30%]

(c) Summarize the principles of strategic roadmapping as a management tool and discuss how a manufacturing business may implement roadmapping to help align its technology and marketing strategies.

[40%]

END OF PAPER

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