

MET3
MANUFACTURING ENGINEERING TRIPOS PART IIB

Wednesday 24 April 2019 9.00 to 12.10

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 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.

- 1 (a) Describe the following two concepts:
- (i) *Innovation system*;
 - (ii) *Valley of death*. [30%]
- (b) Explain, using examples, how new technologies typically evolve. [30%]
- (c) Discuss, using examples, how research technology organisations (RTOs) can help technologies to cross the *valley of death* in an *innovation system*. [40%]

2 You are the Chief Technology Officer (CTO) of a large and internationally operating company that manufactures and sells production equipment, which is used in assembly lines across different industries. After becoming aware of changes in market demand, you have identified that new features need to be integrated in the products to help the company stay competitive in the era of Industry 4.0.

It was decided that the next generation of products needs to be able to communicate with equipment from other manufacturers within Internet-of-Things (IoT) networks through the embedding of specialised software. However, your company possesses very few internal software development capabilities and has a low understanding of the key emerging software technologies in this field.

(a) What *technology intelligence* approaches can your company use to identify available software technologies? [30%]

(b) As a result of the *technology intelligence* exercise you have identified that suitable software technologies are available from different providers. Describe the generic structure of the *technology acquisition process*, particularly expanding on the key issues that need to be considered when evaluating technology providers. [30%]

(c) The *technology intelligence* exercise revealed that a young start-up company is also providing a suitable open source solution. Describe three potential intellectual property related risks of acquiring the open source solution from this start-up company and evaluate their potential consequences for your company. [40%]

3 Nucar is an innovative start-up company in the automotive industry, which makes highly fuel-efficient and zero emissions small cars for local driving. Nucar was set up to sell mobility services, rather than selling cars. The company created a simple pricing structure that enables customers to pay a single monthly fee that covers everything: the car, the maintenance, the insurance and the fuel. This pricing structure makes more profit for the company whilst delivering a more fuel-efficient vehicle.

(a) Explain the concept of a *sustainable business model*. Your answer should provide examples of sustainable value created for the customers from Nucar's operations. [60%]

(b) Explain the concept of the *circular economy* illustrating your answer using examples from Nucar and other industries. [40%]

4 (a) Describe the differences between the following four strategies:

(i) *Corporate strategy*;

(ii) *Business strategy*;

(iii) *Functional strategy*;

(iv) *Operations strategy*.

[40%]

(a) Discuss how *technology roadmapping* can be used to support the development of the strategies listed in part (a) of this question within a large multinational corporation.

[60%]

5 There are currently four supermarket chains in the UK which dominate the industry: Asda, Morrisons, Tesco, and Sainsbury's. Some industry commentators now describe the sector as oligopolistic, i.e. dominated by a few powerful companies.

One of the fastest growing segments of the UK supermarket industry is discount supermarkets such as Aldi and Lidl. All four leading chains have lost market shares to discount supermarkets since 2016. Table 1 shows that in 2017 the UK supermarkets had the following market shares in the grocery trade.

Table 1 Supermarket market shares in 2017

Supermarket	Market share %
Aldi	6.2%
Asda	15.5%
Co-op	6.0%
Iceland	2.3%
Lidl	4.5%
Morrisons	10.9%
Ocado	1.3%
Sainsbury's	16.5%
Tesco	28.1%
Waitrose	5.3%
Rest, including M&S	3.4%

(a) In *channel marketing* what is a *pull strategy* and what is a *push strategy*? [15%]

(b) You have recently graduated and joined the Graduate Management Scheme of one of the big international fast moving consumer goods manufacturing companies. Your first six month placement is as a food Product Manager within the UK marketing department. What are the key differences between marketing to the supermarkets and marketing to consumers (i.e. end users)? Describe and apply classic marketing models (also called tools, techniques, frameworks) to help analyse the situation and support your answer. [30%]

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(c) One of the big supermarkets has approached your company to contract manufacture the supermarket's own *in-house brand*. Your company already supplies its own brand to that supermarket. Discuss the pros and cons of this proposal and how it might affect your company. [30%]

(d) After a number of years as Product Manager you accept a job as Marketing Director of a small specialist food manufacturer that is recognized as being innovative and up-market. Outline the key differences between this new role and your previous role described in part (b) and the different marketing challenges you will need to address. [25%]

6 (a) Describe and compare the following four procurement strategies using examples:

- (i) *Performance based partnership;*
- (ii) *Competitive bidding;*
- (iii) *Securing continuity of supply;*
- (iv) *Category management and e-procurement solutions.* [40%]

(b) Many manufacturing companies are adding services to their existing product portfolios.

- (i) Discuss the business and operational implications for companies moving from a *product-based business model* to a *service/solution-based business model*. [30%]
- (ii) You have been appointed Head of Business Strategy in a large international company. The current business strategy focuses on making and selling aerospace engines. The current business model generates a modest and steady growth, but maintaining this growth is not sustainable in the longer term. Therefore, the board would like you to explore opportunities for new services based on existing products that could stimulate further growth. Provide a complete analysis on how you could use the *phases of service design thinking* model to propose a new service. [30%]

END OF PAPER