
Wednesday 29 April 2026 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 of each booklet.

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.

You may not remove any stationery from the Examination Room.

Question 1

- (a) Using examples from theory and practice to support your answer, discuss how the role of a leader changes as an organisation:
- (i) grows from start-up to established business; and
 - (ii) attempts to respond to an existential crisis once the organisation is established.

[40%]

- (b) You are the Manufacturing Director of a long-established glass manufacturing company that has factories located across Europe. As this is a very energy-intensive business, increases in energy prices are having a direct impact on your competitiveness. One solution is to try to increase the efficiency of the plant to reduce energy requirements. You want to explore how AI could be used to support efficiency gains.
- (i) Following discussions with a start-up company that offers AI-based solutions for factory operations, you have decided to work with this start-up initially at one factory then, if successful, implement this in all your factories. Describe the *change management process* you would follow to deploy such an AI-based solution, highlighting likely challenges and ways to mitigate such challenges.
 - (ii) What might be the role of national government policies in supporting your firm in managing such a change management project?

[60%]

Question 2

Boomerang Ltd is a fleet and logistics management firm. This firm delivers products ordered online for various clothing retailers in the United Kingdom. The Chief Executive attended a conference on quantum computing and is keen to explore the implications of this early-stage technology to improve productivity and build a competitive advantage for Boomerang Ltd.

- (a) Describe what quantum computing is and discuss the benefits of adopting the technology in business.
[30%]
- (b) '*Implementing quantum computing would require business model innovation.*' Discuss this statement.
[30%]
- (c) Explain the opportunities and challenges for Boomerang Ltd to implement quantum computing using the *Business Model Coherence Scorecard*.
[40%]

(TURN OVER

Question 3

You have recently joined a UK-based company as their innovation manager. The company employs about 50 staff, including 20 R&D engineers. It focuses on the design and manufacture of containerised hydrogen production plants. Their plants integrate five technologies: (1) hydrogen-electrolyser modules; (2) hydrogen supply; (3) power grid connection; (4) heat management systems; and (5) monitoring and control systems. The technical expertise to integrate these technologies is extremely important to the company and is being held by a small group of senior engineers.

- (a) Referring to the relevant framework from the lectures, describe the four types of technology-based firms. Which typical challenges tend to be associated with the type you are now working for?

[20%]

- (b) In conversation with the company's Head of Engineering you recognize that the company's IP strategy has so far focused solely on protecting its technical inventions by patents mostly associated with the hydrogen electrolyzer modules and hydrogen source integration into the system. Explain how the IP strategy can be expanded using examples.

[30%]

(cont.

(c) The company recently identified that its current electrolyser efficiency lags behind competing products. To maintain competitiveness, the company is considering acquiring new technology capability externally. It has identified the following three acquisition options:

- **Option A:** A is a small company with an academic team that has developed a breakthrough catalyst coating that can increase hydrogen yield by up to 30%. While their scientific culture mirrors your own engineering-heavy culture, you would require substantial development efforts to integrate their technology with your technology stack.
- **Option B:** B is a large, established automotive supplier. They have developed a novel electrolyser that matches your current performance specifications but is designed for high-volume production, which would significantly lower your unit costs. B operates with rigid, slow-moving corporate hierarchies and "six-sigma" processes that are not aligned with your company's agile, informal, and rapid prototyping culture.
- **Option C:** C is a mid-sized company that currently produces modular electrolysers specifically for the maritime industry. Their technology is a "plug-and-play" match for your containerized dimensions offering additional 10% efficiency gains. They operate a similar "can-do" culture, but there are significant concerns regarding potential friction between the two leadership teams.

Evaluate the three options using the relevant framework presented during the lectures. Recommend which option your company should pursue. Justify your choice.

[50%]

(TURN OVER

Question 4

Global supply chains have become increasingly complex, multi-tiered, and geographically dispersed, giving rise to new risks and vulnerabilities.

- (a) Explain the key concepts of supply chain risk, vulnerability, and resilience. Discuss how disruptions can propagate across multi-tier supply chains. Use examples to support your answer.

[50%]

- (b) Discuss the problem of blind spots in multi-tier supply chains and explain how improved supply chain visibility, traceability, and transparency can enhance supply chain resilience. Use examples to support your answer.

[50%]

Question 5

SolarFlow is a long-established European manufacturer of domestic gas boilers. Its management team recently recognised the need to reposition the company to stay competitive in light of the Energy Transition with shifting consumer trends moving away from gas toward electric heat pumps and smart home energy management systems.

- (a) The management team wants to develop a business transformation strategy. They are considering which tools they should be using for strategy formulation. Describe the following tools:
- (i) *Business model canvas*
 - (ii) *Roadmapping*

[30%]

(cont.

- (b) As SolarFlow navigates the Energy Transition and shifts its product portfolio from gas boilers to smart heat pumps, its management team wants to ensure that technical innovations translate into customer value. They are considering using the *Function-Needs Matrix* or the *Kano Model*. Explain how both tools differ in the context of this question.

[30%]

- (c) When repositioning itself during the Energy Transition, SolarFlow's management team wants to review its capability portfolio to ensure it aligns with its future business transformation strategy. They have asked you to evaluate two capabilities:

- **Smart Grid Optimisation Algorithm:** SolarFlow identified this as critical for its future strategy. The company has only a small internal software development team. In the past, it mostly partnered with external software development houses.
- **Boiler Casing Manufacturing:** The company has invested continuously to build cost-efficient, high-volume manufacturing capability for quality gas boiler casings, which can be leveraged to make casings for heat pumps.

Using the Make-or-Buy matrix, evaluate these two capabilities in light of the company's business transformation strategy. Recommend which of the two options SolarFlow should pursue internally. For your answer, justify where each capability is positioned on the matrix.

[40%]

(TURN OVER

Question 6

- (a) Describe what *industrial symbiosis* is and explain how it can reduce the environmental impact of industry. Using examples to illustrate your answer, discuss the strategic and operational challenges of implementing *industrial symbiosis*.

[30%]

- (b) Describe what is meant by the *circular economy* and identify each of the major loops of the technical side of the *Ellen MacArthur Foundation Circular Economy (EMFCA)* diagram. Discuss the potential benefits and challenges of moving to a circular economy system.

[40%]

- (c) Identify each of the *circular economy business models*. For each business model, identify which loop from the EMFCA diagram the business model is most closely related to and provide a short explanation of why you chose that loop. Discuss any patterns you notice.

[30%]

END OF PAPER