

EGT2
ENGINEERING TRIPOS PART IIA

Thursday 6 May 2021 9.00 to 10.40

Module 3E11

ENVIRONMENTAL SUSTAINABILITY AND BUSINESS

*Answer not more than **two** questions.*

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

Write on single-sided paper.

SPECIAL REQUIREMENTS TO BE SUPPLIED FOR THIS EXAM

CUED approved calculator allowed.

You are allowed access to the electronic version of the Engineering Data Books.

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

The time taken for scanning/uploading answers is 15 minutes.

Your script is to be uploaded as a single consolidated pdf containing all answers.

1 Equinor is a major global energy company with headquarters in Norway. It remains roughly two-thirds owned by the Norwegian state, and changed its name from Statoil in 2018, in part to reflect its increasing commitment to developing and producing renewable energy. Equinor has a presence in 30 countries worldwide and develops oil, gas, wind, and solar energy to deliver to a global customer base. It is known historically for its expertise in offshore exploration and production.

Equinor reports its production numbers as follows (source: Equinor website):

Oil and gas production **per day** in 2019: 2.074 million boe (boe stands for ‘barrels of oil equivalent’ and allows us to normalise production across oil and gas reserves; one boe is the quantity of primary energy released by burning one barrel (about 159 litres) of crude oil).

Renewable electricity production (**annual**) in 2019: 1.8 TWh

1 boe is considered to be approximately equal to 1.7 MWh (1TWh= 10^6 MWh).

(a) In 2019, what fraction of Equinor’s energy production was derived from renewable sources? Explain some broader system considerations that must be taken into account in order to put this fraction into perspective in terms of quantity and quality of environmental impact of the two types of energy sources. [35%]

(b) In early 2020 Equinor announced an ambition to achieve, by 2050, ‘near zero’ greenhouse gas emissions (GHG) from its operated offshore fields and onshore plants in Norway (source: Equinor website). This was regarded as Equinor’s most ambitious commitment on climate, but some investors did not alter their treatment of the company (e.g., a major Danish pension fund did not change its decision to exclude Equinor - and another 9 major crude oil producers - from its investments). Using the dimensions of a materiality matrix, evaluate Equinor’s ‘near zero’ ambition and explain whether you consider this announcement to be a strategically sound move. [65%]

2 You are one year into a job with a medium-sized and fast-growing company that designs drones and leases them to other companies for use in deliveries to customers' homes. So far, your company has been leasing the drones to other companies for use in delivering consumer goods (e.g., books or small products for the home). However, plans are in place to partner with other organisations to support the delivery of critical medical supplies, for example, in remote parts of the UK and elsewhere in the world.

While your company does not manufacture the drones (that is done by suppliers in different countries), technological innovation in the drones' designs is regarded as a key factor that differentiates you from competitors. For example, your company prides itself on the use of innovative materials that make the drones lightweight yet robust, and innovative algorithms that optimize their flight routes.

You were hired in an engineering role, but your manager has recently been asked by senior management to start developing a sustainability strategy and they have become aware of your interest in sustainability. They would like your help with this.

(a) Senior management is eager to begin developing the company's sustainability strategy by first setting some sustainability goals, because potential investors and other stakeholders are asking for these. Your manager has asked for your help making recommendations for:

- i) *whether* to begin with sustainability goals, and,
- ii) if you recommend beginning that way, *how* to approach setting these goals and *why*, **or**,
- iii) if you recommend not beginning that way, *what else* should be done first and *why*?

Draft your response.

[50%]

(b) Now imagine a year has passed since the successful launch of the company's sustainability strategy, based on the recommendations you made in part a). Senior management is concerned that different people in the business are responding differently to the company's sustainability efforts. While on balance many are enthusiastic, they have rather different ideas. For example, the designers are very keen to experiment with lower power batteries and new materials, while the legal team has become extra vigilant about some of the liabilities the company might face (e.g., in relation to electronics waste legislation that bans certain materials from landfill, or privacy laws, etc.). Senior management are now asking for your evaluation of the reasons for these differences, whether they should be concerned about them, and what further steps should be taken to communicate and enable the company's sustainability strategy. Draft your response.

[50%]

3 Lifecycle assessment (LCA) involves four phases: i) goal and scope definition, ii) inventory analysis, iii) lifecycle impact analysis, and iv) interpretation of the results. Each of these four phases involve choices and potential trade-offs that shape the ultimate output of the LCA.

(a) You have been asked to advise a company that is considering using LCA to compare two different packaging approaches for its products. The current packaging, a recyclable plastic package, is to be compared to a biodegradable, recyclable strong paper package. The company senses that some of its consumers are keen to lower the environmental footprint of their consumption, but the company lacks detailed information on consumer preferences on this topic. Further, the company lacks information on the lifecycle impact of its products (clothing), and consumers' practices in relation to both the clothing and the packaging. Explain how you would approach responding to this company's request to conduct a comparative LCA on the packaging. What should they do, and why, to ensure the analysis is useful? [50%]

(b) "The promise of Circular Economy approaches and business models can only be met through the widespread adoption of LCA." Discuss. [50%]

END OF PAPER