



FACULTY OF SCIENCE

DEPARTMENT OF GEOGRAPHY, ENVIRONMENTAL MANAGEMENT & ENERGY STUDIES

MODULE	ENS8X04 ENERGY TECHNOLOGY
CAMPUS	APK
EXAM	NOVEMBER 2021

DATE 11 NOVEMBER 2021

SESSION 08:30 – 11:30

ASSESSOR(S)

DR KRISTY LANGERMAN

EXTERNAL MODERATOR

JOANNE CALITZ (ENERTRAG SA)

DURATION 3 HOURS

MARKS 300

NUMBER OF PAGES: 4 PAGES

Dr K.E. Langerman

Ms J. Calitz

INSTRUCTIONS:

1. Please answer any THREE of the five questions below.
2. If a question is selected, all components of the question should be answered.
3. The format of the answer (essay, paragraph or bullets) and the mark allocation is indicated for each question.

4. Calculators are permitted.
5. **The use of cell phones, email and/or the internet** (except for Blackboard, for students writing remotely) during the examination period **is NOT allowed**.
6. References are not required.
7. **There is to be no communication between students whatsoever between 08:00 and 12:00.**
8. The only communication permitted between 08:00 and 12:00 is with the examiner.
9. No person may assist you in any way to answer the exam questions.
10. The following schedule must be adhered to for students writing remotely:

Time	Action
08:00	Log on to Blackboard and find the exam question paper under Energy Technology – Exam: 11 November 2021. Read the question paper.
08:00-08:30	Email/whatsapp any questions for clarification to the examiner at klangerman@uj.ac.za / 083 704 2543.
08:30-11:30	Write or type your answers to the questions. (If typing, save your file every few minutes as you go along.)
11:30	Stop writing. Exam question paper will be removed from Blackboard.
11:30-12:00	If typing , ensure all your answers are saved in one file. If answers are hand-written , scan your answers. The best way to do this is by downloading the (free) Adobe Scan app onto your cell phone. Scan your answers by taking a series of photographs of the pages with your phone (through the app) and saving as a pdf document. Upload your answers to Blackboard through the Submit exam link found under Exam: 11 November 2021. If any technical problems with Blackboard are experienced, please email exam answers to klangerman@uj.ac.za .
12:00	Deadline for uploading exam answers to Blackboard.

11. Exam answers will be subject to a plagiarism test. Answers that are plagiarised, even in part, will receive zero. The disciplinary process will be followed for those found guilty.

12. If any technical problems are experienced during the exam, please send a screen shot and email/whatsapp to Kristy Langerman (klangerman@uj.ac.za; 083 704 2543).
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QUESTION 1

Sustainable transport. Answer the following questions in paragraph or bullet format:

- a. Discuss three drivers for sustainable transport. [15]
- b. Identify five measures that may be implemented to promote sustainable transport. For each measure, explain how it works and how it improves transport sustainability. [75]
- c. Which initiative/technology do you think should be prioritized in the South African context and why? [10]

Total: [100]

QUESTION 2

Baseload power is traditionally supplied by either coal-fired power plants or nuclear power plants. Answer the following questions in paragraph format:

- a. Compare and contrast the environmental, economic and technical advantages and disadvantages of coal and nuclear generation technologies. [90]
- b. In your opinion, which technology is preferred in the South African environment and why? [10]

Total: [100]

QUESTION 3

Discuss the challenges of integrating electricity generated from renewable sources in the grid, and assess the effectiveness and maturity of three potential solutions to the problem of grid integration. The answer should be in essay format.

[100]

QUESTION 4

Consider the case of a concentrating solar plant (CSP) with thermal energy storage. Answer the following questions in paragraph or bullet format. The workings of equations should be shown.

- a. Calculate the overall efficiency of a CSP, if 80% of the incident radiation is absorbed by the receiver (optical efficiency), the receiver has an efficiency of 50%, the turbine has an efficiency of 50% and the generator has an efficiency of 98%. [10]
- b. State the first and second laws of thermodynamics and explain how both laws apply in a CSP. [40]
- c. Compare and contrast the operation and output of CSPs and solar photovoltaic (PV) installations. [40]
- d. Comment on and account for the role of solar PV and CSP in South Africa's current and future energy mix. [10]

Total: [100]

QUESTION 5

Wind power. Answer the following questions in paragraph or bullet format. Equations and diagrams may also be used.

- a. Explain the operation of a modern horizontal wind turbine, including factors that determine the amount of power generated and the main components of a wind turbine. [30]
- b. Explain the process in South Africa by which wind energy is procured on a grid level. [20]
- c. Discuss siting considerations for new wind farms [10]
- d. Explain the four phases of a typical wind farm construction timeline [40]

Total: [100]

TOTAL [300]
