

January 2024 Assessment Period  
School of Engineering and Materials Science

Module code:

DEN438, DENM035

Module name:

Renewable Energy Sources

Rubric:

You have a maximum of **2:30 hours** to submit your answers.

Your assessment will start at **11:00 GMT on the 4th January 2024**

**It must be submitted by 13:30 GMT on the 4th January 2024.**

Answer ALL questions.

### Assessment Instructions:

- You have a maximum of **2:30 hours** to submit your answers. You have **2:00 hours** to complete your exam paper. The extra **30 minutes** are allocated for you to scan, convert to PDF and upload your completed exam document.
- Answer all questions.
- You can **ONLY** submit PDF files.
- Late submission are **NOT** allowed. Exam responses submitted outside the exam period will **score 0 (zero) marks**.
- Time will automatically be extended for students with documented Exam Access Arrangements.

### By submitting via QMplus, you will be endorsing the following statements:

- *I am aware I will not be allowed to resubmit my work, and I confirm I am uploading the final version.*
- *I have read and understood the school guidelines on assessment on the SEMS Student Handbook.*
- *I am aware of QMUL's regulations on academic misconduct, including plagiarism for assessed work. I have read the guidelines at [Academic Misconduct Policy \(2023-24\)](#) and understand what constitutes plagiarism."*
- *I understand that I will need to make this submission before the end of the 2:30 hours window (2:00 h exam + 30 min submission time) and that late submissions will **NOT** be accepted.*
- *I hereby affirm that the work I am submitting for this assessment is entirely my own."*

### Important items to be aware of:

- Your submission must be your own work, and you must not break any of the rules in the Academic Misconduct Policy (link above). Do not collude with others. Do not ask anyone else to answer the questions for you. All such activities are expressly forbidden. You must answer questions entirely independently.
- All submissions will be subject to inspection for plagiarism and use of external tutoring support. Detection of such activity will constitute an assessment offence
- We reserve the right to viva a percentage of students after each assessment to discuss the answers they have provided as confirmation this is your own work
- Any assessment offences will be referred to the Academic Registrar for consideration by the Chair of the Academic Misconduct Panel, and may subsequently lead to severe penalties including expulsion.
- Please ensure that you read the question rubric (above) carefully and answer all the questions that you are expected to. Make sure it is clear which answer refers to which question.

- If you answer more questions than specified in the rubric, only the first answers up to the number required will be marked. Ensure you delete anything you do not wish to be marked before submission.
- Any question regarding the assessment should be directed to the QMplus module forum. You can expect an answer within the exam hours but may already find the answer to your question within the forum post. We will only help with queries around clarity of the question paper and will not provide any guidance on the answers.

### Where to get help:

If you have any issues submitting on QMplus, please combine all your answers into one single pdf and directly send to :

- [sems-onlineassessment@gmul.ac.uk](mailto:sems-onlineassessment@gmul.ac.uk) BEFORE the deadline. Your file should be named as StudentID\_DEN438/DENM035, eg. 1234567\_DEN438/DENM035.

**Answer ALL THREE questions for 100 marks**

**Question 1**

- a) Discuss the potential application of hydrogen for domestic heating in the UK.  
**[10 marks]**
- b) Discuss the potential applications of hydrogen for different sectors in the UK.  
**[10 marks]**
- c) Discuss the economic, environmental and social impacts of the use of hydrogen.  
**[10 marks]**

**Turn over**

## Question 2

- a) Discuss the healthy building and its impact on the design of building energy systems and energy consumptions

**[10 marks]**

- b) Design a building integrated photovoltaic/thermal energy system e.g. photovoltaic /geothermal heat pump system. Explain the working principle.

**[10 marks]**

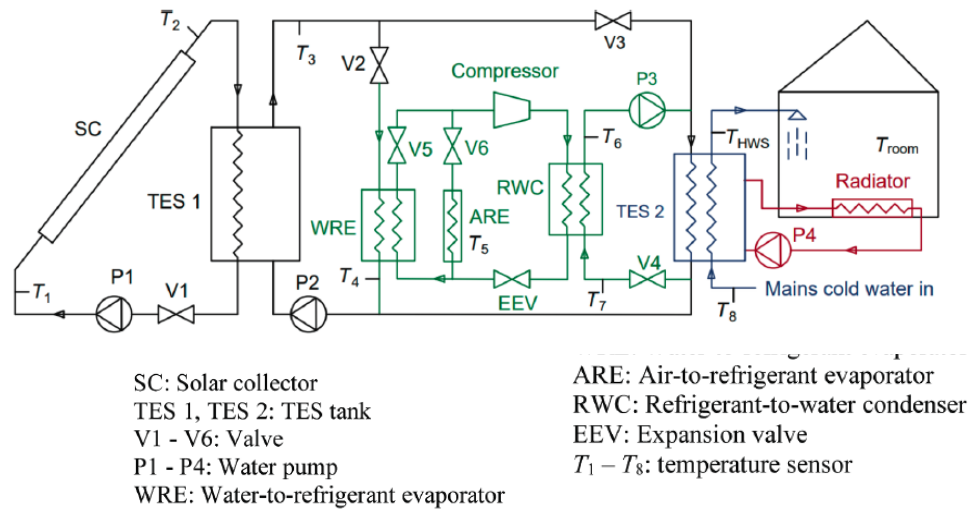
- c) Discuss the relation between the energy crisis and the extreme weather on Earth.

**[10 marks]**

**Turn over**

### Question 3

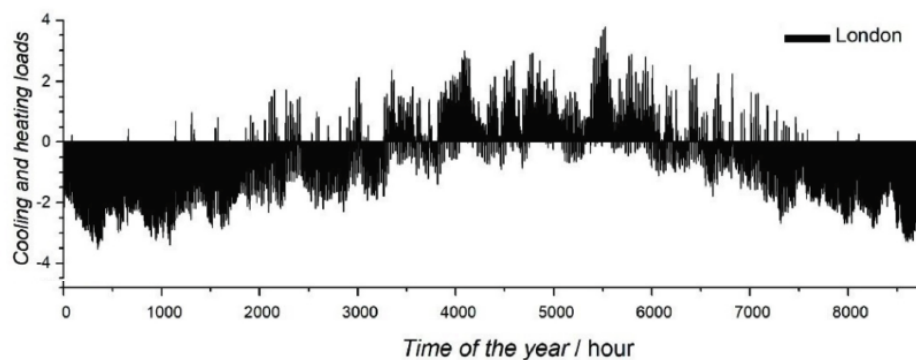
- a) **Figure 3a** below shows the schematic of a dual-source heat pump heating system. Explain the working principle.



**Figure 3a Schematic of dual-source heat pump heating system**

[20 marks]

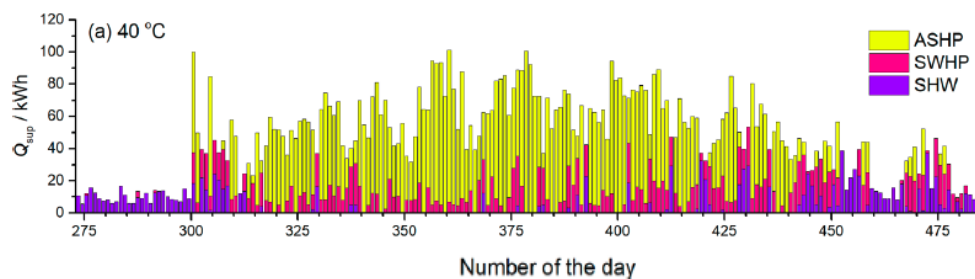
- b) **Figure 3b** shows hourly cooling (positive) and heating (negative) loads of a house at a room air temperature covering a typical year of weather conditions in London. Briefly describe how to size the heat pump heating system.



**Figure 3b Hourly cooling and heating loads**

[10 marks]

- c) **Figure 3c** shows daily variations of heat provision by direct solar hot water (SHW), air source heat pump (ASHP) and solar water heat pump (SWHP) over a heating season. Analyse the seasonal performance of the heating system.



**Figure 3c Daily variations of heat provision by SHW, ASHP and SWHP.**

[10 marks]

**End of Paper**