

EXAMINATION FOR INTERNAL STUDENTS

For the following qualifications:-

M.Sc.

ESGE4: Building Solar Design

COURSE CODE : ENVSGE04

DATE : 26-Aug-03

TIME : 10.00

TIME ALLOWED : 2 hours

UNIVERSITY OF LONDON

MSc DEGREE IN SCIENCE in BUILT ENVIRONMENT 2003: RESIT PAPER

for Internal Students of University College London

Module ENVS GE 04: BUILDING SOLAR DESIGN

Answer TWO questions only. Answer all parts of the questions chosen.

1. (a) Explain the terms "building bioclimatic design" and "climatic envelope". (10 marks)
 - (b) On a sketch of a psychrometric chart, draw on the approximate climatic envelopes for (i) a hot-dry climate and (ii) a warm-humid climate. (10 marks)
 - (c) For a hot-dry climate, discuss the range of building design options available for a domestic building to reduce the impact of the climate on the internal thermal comfort conditions. (10 marks)
 - (d) For a warm-humid climate, discuss the range of building design options available for a domestic building to reduce the impact of the climate on the internal thermal comfort conditions. (10 marks)
 - (e) What other factors in these two climates might have an affect on how domestic buildings are laid out and constructed. (10 marks)
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2. (a) Describe in general, illustrating your answer with diagrams and sketches where appropriate, **EITHER** a dwelling **OR** a commercial building, which you have studied in detail and which has attempted to optimise its solar energy performance, or has used a passive or hybrid method to control its internal environment. (10 marks)
Describe in detail, again using diagrams and sketches for illustration where appropriate, the passive and/or hybrid systems which have been used to control the environmental and energy performance of the building. (25 marks)
 - (b) Discuss any weaknesses (and/or failures) of the intended strategy and comment on any disadvantages which have appeared by implementing the strategy, or which were inherent in it. (15 marks)

TURN OVER

3. (a) Explain how heat moves through a double glazed window. (10 marks)
- (b) In this context, explain briefly the meaning of i) reflectance, ii) transmittance and iii) absorptance. (10 marks)
- (c) Explain how low-emittance spectrally-selective coatings reduce the U-value of glazing systems. (10 marks)
- (d) Glazing manufacturers are currently developing evacuated glazing. Explain the concept, and its advantages and disadvantages. (5 marks)
- (e) There is currently considerable research into electrochromic glazing. Explain very briefly the concept behind the technology (5 marks), and discuss the benefits and drawbacks of using it for an office building in the UK. (10 marks)
4. Describe, using sketches and diagrams where appropriate, the main components of a solar water heating system suitable for use in the UK and describe the differences in the three systems which would be required to provide the following:
- (i) water heating for an outdoor swimming pool, (10 marks)
 - (ii) hot water for domestic washing (15 marks), and
 - (iii) space heating for a house. (15 marks)

In your description you should focus on appropriate collector and storage design and resulting efficiency for each application, and clearly state the reasons for selecting each particular component.

Explain the main barriers to the cost-effective use of solar water heating in the UK. (10 marks)

END OF PAPER