UNIVERSITY COLLEGE LONDON

University of London

EXAMINATION FOR INTERNAL STUDENTS

For The Following Qualification:-

M.Sc.

ESGL3: Lighting: Current Research Issues

COURSE CODE	:	**ENVSGL03**
DATE	:	**06-MAY-05**
TIME	:	**10.00**
TIME ALLOWED	:	**3 Hours**

TURN OVER

UNIVERSITY OF LONDON

MSc DEGREE IN BUILT ENVIRONMENT 2005
for Internal Students of University College London

ESGL3: Lighting: current research issues

Answer **FOUR** questions.

All questions carry equal marks. Use annotated sketches.

1. Psychologists use bipolar semantic differential rating scales to compare participants' reactions to different colours in a colour atlas, or in an architectural model or in a real building. The Munsell System is often used to specify coloured stimuli in terms of their Munsell co-ordinates.

   A recent study of colours assessed in isolation and in a model room identified four Factors, identified by factor analysis, which were important in the assessment of colour. The Factors are shown in Table 1 together with their constituent semantic rating scales.

Table 1

Factor	Semantic Rating Scale
Dynamism	active ----- passive sharp ----- dull exciting ----- calming
Spaciousness	closed ----- open constricted ----- free cramped ----- spacious
Warmth	hot ----- cold soft ----- hard lush ----- austere
Complexity	complex ----- simple unusual ----- usual

   For each Factor above, predict the extent to which it depends upon each of the Munsell co-ordinates. Examine the extent to which the judgements in Table 1 indicate a physiological relation between colour and subjective assessment or are based on learning and cultural influences?

TURN OVER

2. a) Compare the variety of spectral power distributions emitted by lamp types in common use together with that of daylight.

b) Discuss how theoretical and experimental work in the areas of correction to the $V\lambda$ curve and subjective response to lamps of different spectral output has led to a re-evaluation of daylight and those sources rich in blue light.

3. a) Within the lighting community there has been much debate concerning a Metric of Lighting Quality. Propose reasons for encouraging the development of such a Metric.

b) Compare the advantages or otherwise of delivering a Metric to the lighting community using the following methods:

i) Codes of Practice eg. SLL Code for Lighting

ii) single number Metric eg. CSP index

iii) prescriptive eg. Pattern Book approach.

4. a) Rendering and simulation of exterior and interior lighting designs using software tools is rapidly advancing. Explain, using examples of currently available software, the difficulties in model generation and simulation/rendering that pose problems for the designer in accurate photometric visualisation.

b) Critically appraise the value and benefits in the physical modelling of lighting design proposals.

5. "In my opinion the future of lighting research in interiors lies in a move beyond visibility and visual discomfort to areas where lighting operates through the 'message' it sends and hence how it affects mood and behavior, and through the circadian system and hence how it affects the task performance and human health"

Boyce P R. 'Lighting Research for Interiors: The Beginning of the End or the End of the Beginning'. *Lighting Research & Technology*, Vol 36 No 3 (2004) pp1-12.

Discuss this statement and indicate future directions for lighting research.

CONTINUED

6. Compare the handling of natural light, with reference to appropriate case study examples, in the work of Alvar Aalto, Le Corbusier and Frank Lloyd Wright.

7. Correlation and multi-factorial studies in lighting research have indicated, to a limited extent, the significance of qualitative aspects in visual judgements of interiors. Discuss future lines of research that would attempt to answer the question posed by Warren Julian:

"Thus, with the exception of discomfort glare, there are no tools for the designer to apply in trying to predict a design outcome in terms of how people respond."

8. The lighting in a real room can be characterised by the *illuminance solid*, an example of which is shown in Figure 1.

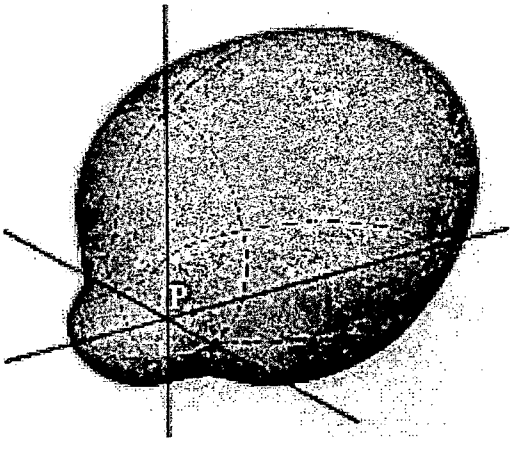

Figure 1. The illuminance solid

a) Distinguish between the *vector* and *symmetric* components of the illuminance solid.

b) The concept of cubic illumination was originated by Cuttle in 1997. Describe how cubic illuminance may be calculated and measured and how the concept may be used to generate illumination metrics.

END OF PAPER