

**OLLSCOIL NA hÉIREANN, GAILLIMH  
NATIONAL UNIVERSITY OF IRELAND, GALWAY**

**SUMMER EXAMINATIONS 1998-1999**

**ERGONOMICS IE407**

**B.E. INDUSTRIAL ENGINEERING AND INFORMATION SYSTEMS**

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Mr. E.F. Fallon**

**Time Allowed: 3 Hours**

**Attempt 5 Questions**

**Use Separate Answer Books for each Section**

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**SECTION A: Applied Ergonomics**

**Question 1.**

**Marks**

Write short notes on **four** of the following:

**4x5**

- (a) Wicken's information processing model
- (b) Signal Detection Theory (SDT)
- (c) Spatial frequency
- (d) Principles of symbolic design
- (e) Object displays
- (f) Principles of arranging components

**Question 2.**

**Marks**

Answer three of the following:

**6.66\*x3**

- (a) Distinguish between open-loop and closed-loop systems.
- (b) What do we mean by the term human-machine system?
- (c) Briefly outline the characteristics of human-machine systems
- (d) List some criterion measures that could be used to evaluate a new

home computer system. Include system-descriptive, task performance, and human criteria.

**Question 3.**

**Marks**

- (a) Distinguish between conceptual compatibility, movement compatibility, spatial compatibility and modality compatibility. 8
- (b) Distinguish between selective attention, focused attention, divided attention and sustain attention. Indicate some methods for improving performance in each type of task. 12

**Question 4**

**Marks**

Describe the Hierarchical Task Analysis (HTA) method of task analysis. 20  
Outline the advantages and disadvantages of the technique. Use HTA to describe a short task of your choice.

**Question 5.**

**Marks**

- (a) Explain what you understand by the following terms in the context of allocation of functions: 8
- Cost-based allocation
  - Affective support
  - Cognitive support
  - Dynamic allocation
- 12
- (b) Discuss the role of allocation of functions in systems design.

**SECTION B: Physical Ergonomics**

**Question 6.**

**Marks**

Write short explanatory notes on **four** of the following:

**4x5**

- (a) RULA
- (b) Decomposition method of task analysis
- (c) Constraints in anthropometrics
- (d) Principles of Hand tool design
- (e) Risk factors associated with WRULDs
- (f) EU Directive 90/270/EEC on minimum requirements for work with display screen equipment

**Question 7.****Marks**

- (a) Write down the revised NIOSH lifting equation 1991 and explain each of its components. 8
- (b) The 1991 lifting equation is based on three criteria derived from the scientific literature and combined judgement of experts from the field of biomechanics, psychophysics and work physiology. Explain the main issues underlying the choice of the psychophysics criteria. 12

**Question 8.****Marks**

- (a) Outline a number of principles of hand tool design. 8
- (b) Discuss the implications of poor hand tool design for the development of Work Related Upper Limb Disorders (WRULDS) 12