GX586

OLLSCOIL NA hÉIREANN, GAILLIMH

NATIONAL UNIVERSITY OF IRELAND, GALWAY

SEMESTER II EXAMINATIONS 2000-2001

BE INDUSTRIAL ENGINEERING AND INFORMATION SYSTEMS

Human Factors Engineering IE438

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Instructions:

Time Allowed: 3 Hours
Attempt: 5 Questions
Show all your work clearly
Use separate answer books for each section

Section A: Ergonomics of the Workplace

Question		Marks
Q.1	Write short notes on **four** of the following:	5x4

- The main mechanical hazards associated with Advanced Manufacturing Technology (AMT)
- Design guidelines for product assembly
- Effects of shiftwork on performance and productivity
- Heat stress management
- Anthropometrics and the design of seating
- Hierarchical Task Analysis (HTA)

Q.2 (a) What are the main risk factors associated with work related musculoskeletal disorders (WMSDs) **6**

(b) With reference to Figure 1. – Redesign the soldering iron to reduce the risk of Work Related Musculoskeletal Disorders (WMSDs). Outline the rationale for your new design. **6**

(c) What is trigger finger? Discuss the disorder in detail in the context of work. **8**

Q.3 The application of ergonomics to the design of workspaces and machines is problematic. Discuss this statement in the light of your knowledge of ergonomics and your experience to date of its application. Use examples where appropriate to illustrate your answer. **20**

Q.4 (a) Briefly outline the three criteria used in developing the 1991 NIOSH Equation for the Design and Evaluation of Manual Lifting? Describe in detail the rationale for the selection of **one** of these criteria. **8**

(b) With both hands directly in front of the body, a worker lifts the core of a 16kg roll of paper from a cart, then shifts the roll in the hands and holds it by the sides to position it on a machine, as shown in Figure 2. below. Significant control of the roll is required at the destination of the lift. Also, the worker must crouch at the destination of the lift to support the roll in front of the body, but does not have to twist. **12**

Evaluate the acceptability of this manual lifting task using the 1991 NIOSH Equation. Make suggestions for redesign of the lifting task based on the outcome of your analysis.

Note: The relevant tables for use with the NIOSH Equation are included below.

Section B: Human and Organisational Aspects of Operations

Q.5 Write short notes on **four** of the following: **5x4**

- Job enrichment
- Supervisory Control
- Safety in Advanced Manufacturing Technology (AMT)
- Biological approach to job design
- Modern manufacturing initiatives
- Skill-based manufacturing

Q.6 Compare and contrast the lean manufacturing and sociotechnical systems approaches to the management and operation of modern manufacturing systems. In your answer carefully consider the impact on the worker. **20**

Q.7 (a) Discuss the main design recommendations for the design of teams. **12**

(b) The purpose of an evaluation study for either job or team design is to provide an objective evaluation of success and to create a tracking and feedback system to make adjustments during the course of the design project. What tools can be used to carry out such an evaluation study? **8**

Q.8 (a) According to HITOP, what are the skills that are needed to operate, manage and support virtually any AMT installation. **6**

(b) Figure 3 is an outline process chart of Buzz-Beer Milk Products proposed new Cream Liqueur production process. Figure 4 contains a completed HITOP worksheet for JOB Requirements for core work and support functions for the process. Using your knowledge of the process and similar plants, specify the Skill Requirements for the ETRs. Justify your answer. **14**