

The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Textile and Apparel Technology



Study Programmes : Bachelor of Science Honours in Engineering/
Bachelor of Industrial Studies Honours
Name of the Examination: Final Examination
Course Code and Title : TAX6556 Ergonomics
Academic Year : 2023/2024
Date : 11th March 2025
Time : 1330 – 1630hrs
Duration : 3 hours

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Eight (8)** questions in **Four (4)** pages.
3. Write down your Index Number in all the pages of answer scripts.
4. Answer the **question one (Q1)**, which is compulsory and **five (05) more questions** from Q2 to Q8. Question one (Q1) carries 25 marks and questions two (Q2) to eight (Q8) carry fifteen (15) marks each.
5. Answers to each question should commence on a new page. If a question has many parts, all the parts should be answered in the chronological order under the same question.
6. Write down the answered question numbers in the answer book.
7. Answers should be in clear handwriting.
8. Do not use red colour pens to write the answers.

Compulsory Question

- (Q1) (a) What is the primary goal of ergonomics? (03 marks)
- (b) Differentiate the terms “muscular endurance” and “muscular strength” in relation to physical work. (03 marks)
- (c) State three (03) study areas of human cognition. (03 marks)
- (d) What factors should be considered when designing an efficient shift schedule for manufacturing organizations? (04 marks)
- (e) Define the term “Cumulative Trauma Disorders (CTDs) “ (03 marks)
- (f) Write down three (03) advantages and three (03) disadvantages of utilizing rotating shifts in manufacturing organizations. (06 marks)
- (g) State three (03) factors that affect the health and safety of workers at workplaces. (03 marks)

Answer any five (05) questions from the following seven (07) questions

- (Q2) (a) List and describe the three (03) human, three (3) machine, and three (03) local environment components of a human-machine work system. (09 marks)
- (b) A control room operator in a power plant experiences high fatigue and reduced performance. Discuss the possible reasons for high fatigue and reduced performance of the operator in relation to the local environment. (06 marks)
- (Q3) (a) State five (05) basic components of fitness. (05 marks)
- (b) Define the term “Maximal Aerobic Capacity (VO_2 max)”. (04 marks)
- (c) With the increase of automation in industrial applications, the VO_2 max has become an important factor in the assessment of tasks. Explain how VO_2 max assessment helps to determine which tasks should remain manual and which tasks should be automated (06 marks)

(Q4) (a) State the key steps in Human Performance Technology (HPT), and explain how they contribute to improve organizational performance. (10 marks)

(b) Explain the strategies that employers/management can use to provide a healthy work-life balance and reduce job-related stress at workplaces.

(05 marks)

(Q5) (a) The following table presents the data on worker complaints related to ergonomic discomfort in a manufacturing organization.

Ergonomic Issue	Percentage of workers affected	Common Causes
Back Pain	45%	Poor seating, improper posture
Eye Strain	30%	Inadequate lighting, screen glare
Fatigue & Low Energy	55%	Shift timing, repetitive tasks
Heat Discomfort	40%	Poor ventilation, excessive use of Personal Protective Equipment
Restricted Movement	35%	Poor workstation design, heavy uniforms

Using the above data, explain **three (03) major ergonomic risk factors**, that contribute to worker discomfort and how these factors negatively affect worker health, performance, and long-term productivity in an organizational environment. (09 marks)

(b) For each of the three (03) risk factors identified in part (a), propose an ergonomic solution to improve worker comfort and efficiency. (*Your answer should include: A detailed explanation of the solution and ergonomic principles behind the solution.) (06 marks)

- (Q6) (a) A manufacturing organization wants to improve employee motivation and to reduce employee turnover. Describe how they can use job design principles effectively to achieve these goals. (06 marks)
- (b) Write a comprehensive description of the key guidelines for designing warning lights and displays. (09 marks)
- (Q7) (a) Providing two (02) examples for each variable, describe the three (03) primary classes of variables that influence the working posture of human beings. (09 marks)
- (b) It was reported that an employee has discomfort on the back of the thighs after sitting for an extended period. Explain how you could adjust the seat design to reduce this discomfort and improve circulation during long sitting periods. (06 marks)
- (Q8) (a) State three (03) design philosophies, which can be used to design workplaces. (03 marks)
- (b) Write short notes on the following.
- i) Seated workstations
 - ii) Standing workstations (06 marks)
- (c) Explain how does color in the workplace impacts ergonomics, and write a short note on the best colour choices for different work environments. (06 marks)