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

Study Programme	: Bachelor of Technology Honours in Engineering/ Bachelor of Industrial Studies Honours
Name of the Examination	: Final Examination
Course Code and Title	**: TAX6556 Ergonomics**
Academic Year	: 2021/2022
Date	: 03rd February 2023
Time	: 0930 - 1230hrs
Duration	: **3 hours**

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Eight (8)** questions in **Five (5)** 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 hand writing.
8. Do not use red colour pens to write the answers.

Compulsory Question

(Q1) (a) Ergonomic principles for workplace designing are based on three (03) recommendations. Name them. (03 marks)

(b) State three (03) job designing techniques, which can be used to avoid the monotony of work. (03 marks)

(c) Mention three (03) common types of visual display instruments found in the industries. (03 marks)

(d) Write down the desirable thermal conditions for the below given parameters.

i) Air temperature

ii) Air humidity

iii) Air movement

iv) Radiant temperature (04 marks)

(e) State three (03) types of task performances, which are common in the industries. (03 marks)

(f) Mention five (05) basic components of fitness of human beings. (05 marks)

(g) List two (02) benefits each for the below given parties as a results of the application of ergonomics.

i) Employers

ii) Employees (04 marks)

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

(Q2) (a) Discuss why the application of ergonomic concepts are more appropriate to the production areas of garment manufacturing organizations. (06 marks)

(b) Giving examples, describe the multi-disciplinary nature of ergonomics. (06 marks)

(c) Define the following terms in relation to the "Human- Machine" system.

i) Displays

ii) Controls

iii) Workspace (03 marks)

(Q3) (a) Write a short note on the factors, which determine the metabolic rate of an individual. (05 marks)

(b) Briefly discuss the ways/methods that can be used to increase the metabolism of human beings. (04 marks)

(c) Providing oxygen consumption profiles, describe the work designing concepts "Intermittent work" and "Prolonged work". (06 marks)

(Q4) (a) Briefly discuss the four (04) steps of the process of "Human performance technology". (04 marks)

(b) What is "Job analysis"? Prepare a suitable "Job analysis" for a merchandiser of an apparel manufacturing organization. (07 marks)

(c) With an aid of suitable example describe the concept of "Flexi-time", which can be employed in work organizations. (04 marks)

(Q5) (a) Briefly discuss the techniques, which can be used to control the excessive noise at workplaces. (06 marks)

(b) A worker, who works in a manufacturing plant, is subjected to the following noises during the eight hour period. The operator works in five different sections during the eight hour period. Prove that the worker is at risk.

(09 marks)

Section	Noise Level	Duration in hours
A	80dBA	2
B	75 dBA	1
C	95 dBA	1
D	100dBA	3
E	85 dBA	1

(Q6) (a) Providing suitable equations and standards describe a suitable method, which can be used to determine vibration levels at the workplaces. (08 marks)

(b) A worker, who works in a textile mill, is subjected to different vibration levels during the eight hour period as given below. Calculate the vibration exposure values in the directions X, Y and Z. By using the calculated values, determine whether the worker is at risk or not. (07 marks)

Duration of the exposure to the vibration (hours)	Component acceleration (ms^{-2})		
	X	Y	Z
2	5	8	4
2	4	2	7
3	6	1	4
1	2	2	3

(Q7) (a) Briefly describe the operating mechanisms of the below given shift rotational methods. Assume that the work should be carried out continuously in three shifts during a day.

i) Continental rotation

ii) Metropolitan rotation (06 marks)

(b) Prepare a shift rotational schedule for a month of February by using the Continental rotational method. Assume that the month has 28 days and the first day of the month is a Monday. (09 marks)

(Q8) (a) Briefly explain the three (03) widely used design philosophies in designing machines, tools and equipment. (06 marks)

(b) Describe the situations, where the following workstations can be effectively employed in manufacturing organizations.

i) Seated workstations

ii) Standing workstations (06 marks)

(c) Briefly discuss the advantages of "Seated workstations" over the "Standing workstations". (03 marks)