

UNIVERSITY OF RUHUNA

SECOND EXAMINATION IN B.Sc. IN GREEN TECHNOLOGY (PART II)- September 2020

Ergonomics (EN2206)

Time 2 hrs.

Answer only **FOUR** questions.

Use the given answer book to answer the questions.

All question carries equal marks.

01. (a) (i) Briefly describe the importance of ergonomics in the following condition;
- a. During participation of Lectures
 - b. Computer operation
 - c. Carrying a load (15 kg)
 - d. Manual record keeping
- (20 Marks)
- (ii) What are the advantages and constraints of applying ergonomic principle in Sri Lanka?
(20 Marks)
- (b) (i) Enlist the main principles of green ergonomics.
(20 Marks)
- (ii) Categorize the areas of green ergonomics application.
(20 Marks)
- (iii) What are the factors to be considered in designing an ergonomically appropriate workstation with 'green ergonomics' concept?
(20 Marks)
02. (a) (i) How do you apply anthropometric data when you design;
- a. Shoes for teenagers
 - b. A drawing table for engineering student
 - c. Working benches in the laboratory
- (30 Marks)
- (ii) Define the followings and discuss the use of these in ergonomics research.
- a. Relative Aerobic Strain (RAS)
 - b. Heart rate
 - c. Oxygen consumption
- (30 Marks)
- (b) Differentiate the following paired terms used in body movement classification with giving examples.
- a. Abduction and Adduction
 - b. Repetitive and Sequential
 - c. Pronation and Supination
 - d. Lateral rotation and medial rotation
- (40 Marks)

03. (i) Describe the effect of static and dynamic muscular works on physiology of human body. (30 Marks)
- (ii) What are the factors to be considered in proper arrangement of controls in work place layout? (20 Marks)
- (iii) What are the medical parameters to be considered in tractor seat designing? (30 Marks)
- (iv) Discuss the important of 'zone of comfort' and 'zone of reach' in placing the control. (20 Marks)

04. (a) (i) Differentiate the SIP (Seat Index Point) and SRP (Seat Reference Point) using suitable diagram in automobile seat designing. (30 Marks)
- (ii) What are the different elemental motions used in Motion Time Measurement (MTM) System? (25 Marks)
- (b) Calculate hand elemental motion times in seconds for the followings using the given table. (45 Marks)
- (i) Moving a load of 20 kg using both hands a distance of 60 cm to an exact location.
- (ii) Sliding a 32 kg load using both hands a distance of 50 cm across a table (surface friction factor is 0.25) to an approximate location.
- (iii) Moving a load of 20 kg against stop for a distance of 50 cm.

05. (i) Differentiate the purpose of models and mockups in design engineering. (25 Marks)
- (ii) Enlist the steps of applying anthropometric data when you plan to design a chair for secondary school students. (20 Marks)
- (iii) Describe the importance of different body shapes in designing a workspace. (15 Marks)
- (iv) Describe the following factors as reasons for accidents during carrying out some operation. (40 Marks)
- a. Machine factors
 - b. Operational Factors
 - c. Human Factors
 - d. Situational / environmental Factors

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Table for the question 4-part (b)

Predicted move- time data in which a move is defined as a motion of the hand required to transport an object

(from MTM Association for Standards and Research, Fairawn, NJ 07410)

Distance Moved (cm)	Time, TMUs				Weight (kg) up to	Allowance			Case and Description
	A	B	C	Hand in Motion B		Constant (TMUs)	Factor		
0 to 2	2.9	2.0	2.0	1.7	1	0	1.00	A Move object to other hand or against stop	
4	3.1	4.0	4.5	2.8	2	1.6	1.04		
6	4.1	5.0	5.8	3.1	4	2.8	1.07		
8	5.1	5.9	6.9	3.7					
10	6.0	6.8	7.9	4.3	6	4.3	1.12		
12	6.9	7.7	8.8	4.9					
14	7.7	8.5	9.8	5.4					
16	8.3	9.2	10.5	6.0					
18	9.0	9.8	11.1	6.5	8	5.8	1.17		B Move object to approximate or indefinite location
20	9.6	10.5	11.7	7.1	10	7.3	1.22		
22	10.2	11.2	12.4	7.6					
24	10.8	11.8	13.0	8.2	12	8.8	1.27		
26	11.5	12.3	13.7	8.7					
28	12.1	12.8	14.4	9.3	14	10.4	1.32		
30	12.7	13.3	15.1	9.8					
35	14.3	14.5	16.8	11.2	16	11.9	1.36	C Move object to exact location	
40	15.8	15.6	18.5	12.6					
45	17.4	16.8	20.1	14.0	18	13.4	1.41		
50	19.0	18.0	21.8	15.4					
55	20.5	19.2	23.5	16.8	20	14.9	1.46		
60	22.1	20.4	25.2	18.2					
65	23.6	21.6	26.9	19.5	22	16.4	1.51		
70	25.2	22.8	28.6	20.9					
75	26.7	24.0	30.3	22.3					
80	28.3	25.2	32.0	23.7					