



UNIVERSITY OF RUHUNA
FACULTY OF AGRICULTURE
Third Examination in BSc Agricultural Resource Management & Technology - (Part I) April
- 2021

EN 3102 Ergonomics – (Optional)

TIME: 2 Hours

ESSAY TYPE

Answer only FOUR questions.

Use the given answer book to answer the questions.

Only non-programmable calculators are permitted.

Mobile phones are not allowed.

All questions carry equal marks.

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1. (i) Why the ergonomic aspects are important in agricultural operations? (25 marks)
- (ii) "Ergonomics draws on many disciplines to optimize the interaction between the work environment and the worker". What are the main disciplines involved? (25 marks)
- (iii) What are the benefits achieved by industry by following ergonomics principles? (20 marks)
- (iv) What are the factors to be considered when you prepare an activity plan to apply ergonomics in a garment industry? (30 marks)
2. (a) Describe the elements involving in basic human factors when performing a task. (20 marks)
- (b) (i) What is the importance of using anthropometric data in design considerations? (20 marks)
- (ii) When you design a new lecture theatre what are the anthropometric factors you consider? What are the ways of using anthropometric dimensions in each factors? (30 marks)
- (c) Differentiate the following terms that are used in body movement. (30 marks)
- a. Abduction and Adduction
 - b. Pronation and Supination
 - c. Dorsal and Ventral
3. (i) What are the medical parameters to be considered in designing a tractor seat? (20 marks)
- (ii) Differentiate the „SRP“ (Seat Reference Point) and SIP (Seat Index Point) using a suitable sketch. (20 marks)
- (iii) Explain the importance of following factors in safety operations. (40 marks)
- a. Human factors
 - b. Machine factors
 - c. Operational factors
 - d. Environmental factors

4. (a) (i) Describe the importance of the Maximum area and Normal area of a worker in a workplace in locating an operating control. (20 marks)

(ii) What are the steps of Motion Time Measurement (MTM) analysis? (20 marks)

(iii) What do you mean by time measurement units (TMU)? Briefly explain the importance of TMU compared to normal time measurements? (15 marks)

(b) Calculate hand elemental motion times in seconds for the followings (use the given table).

(i) Moving a load of 16 kg with one hand a distance of 40 cm to an approximate location.

(ii) Sliding a 24 kg load using both hands a distance of 28 cm across a table (surface friction factor is 0.4) to an exact location

(iii) Moving a load of 36 kg using both hands a distance of 80 cm to an exact location.

(45 marks)

5. (i) Compare the difference between standing and seated posture in human body ergonomics. (20 marks)

(ii) Describe the application electromyography (EMG) in ergonomics research. (20 marks)

(iii) Critically comment on the statement "Comfort of an operator is a function of vibrations". (20 marks)

(iv) What are the machine parameters that are influenced on the ride vibration characteristics of a Self-propelled machine? (20 marks)

(v) Suggest a measurement system to estimate vibration of an off road vehicle. (20 marks)

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TABLE 7.1 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, Fairlawn, NJ 07410)

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