UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2014 SESSION

SUBJECT CODE	:	**FIB 38004**
SUBJECT TITLE	:	**WORK STUDY AND INDUSTRIAL ERGONOMICS**
LEVEL	:	**BACHELOR**
TIME / DURATION	:	**(2.5 HOURS)**
DATE	:	

INSTRUCTIONS TO CANDIDATES

1.   Please read the instructions given in the question paper CAREFULLY.

2.   This question paper is printed on both sides of the paper.

3.   Please write your answers on the answer booklet provided.

4.   Answer should be written in blue or black ink except for sketching, graphic and illustration.

5.   This question paper consists of TWO (2) sections. Section A and B. Answer all questions in Section A. For Section B, answer three (3) questions only.

6.   Answer all questions in English.

7.   Percentage Points of the *t* Distribution table is appended on Appendix A.

THERE ARE 6 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 40 marks)
INSTRUCTION: Answer ALL questions. Please use the answer booklet provided.

Question 1

Describe two (2) general requirement guidelines for designing a workplace.

(10 marks)

Question 2

Briefly describe four (4) principle of component arrangement related to ergonomics layout.

(10 marks)

Question 3

Describe five (5) the factors that can cause Cumulative Trauma Disorder (CTD)

(10 marks)

Question 4

Describe two (2) analysis methods to reduce ergonomics problem during assembly process?

(10 marks)

SECTION B (Total: 60 marks)
INSTRUCTION: Answer THREE (3) questions only.
Please use the answer booklet provided.

Question 6

Answer the following questions based on the data given below:

> One of the products made by a company is tank for liquid storage. Based on observations, the process of manufacturing this tank is as follows. The value in the bracket shows the process duration.

> ➢ Material (metal sheet) is transported from store to the marking area, to mark the material (10 min.) for ease of cutting process. The cutting process (20 min.) then takes place at another area within the premise.

> ➢ The material then moved to welding workshop to be joined (45 min.) and then cleaned (15 min.) from slag before being sent for storage in the store.

> ➢ When the time for delivery to the customer is near, the tanks are sent to the liquid proofing section where the joints are sealed (60 min.) with silicon to ensure that there is no leak.

> ➢ It is then sent to the paint section. Before painting is conducted, the tanks are checked (20 min.) for leaks and only properly sealed tanks are accepted. If the tank is not properly seal, it will be sent back to liquid proofing section for reseal.

> ➢ After painting (45 min.), the tanks are set aside to dry (240 min.) before being sent to the finishing department where the tanks are painted (20 min.) with company's logo. The completed tanks are then sent to the store waiting for delivery.

a) Construct a Process Flow Chart.

(8 marks)

b) Analyze the chart that you have constructed in Q6 (a) and identify two (2) weaknesses in the tank making process.

(2 marks)

c) Develop another method/process that will overcome the identified weakness in Q6 (b) and construct another Process Flow Chart.

(10 marks)

Question 7

The production of product WR01J consists of 5 elements; A, B, C. D. and E. Continuous stop watch method were used for element A to D (Table 1) but snap back for E (Table 2). For every cycle, 2 unit of WR01J were processed. Element D is a fully done by machine. During the 3rd cycle of element B, the operator was distracted by his supervisor. However, element E only occur about every 6 cycles.

Table 1: Observed time for element A - D

Element	Observed time of each cycle (seconds)			
	1	2	3	4
A	5.1	25.5	46	96.8
B	15.1	35.7	86.0	107.0
C	18.4	39.0	89.5	110.3
D	20.5	41.0	91.6	112.3

Table 2: Observed time for element E

Element	Observed time (seconds)			
	1	2	3	4
E	12.3	11.4	12.0	13.0

a) As continuous stop watch method were used for element A, B, C, and D; calculate the actual observed time for each element for each cycle.

(4 marks)

b) Calculate the number of observation required to achieve 95% confidence level and 5% error for each element.

(8 marks)

c) Calculate the standard time for this job. Average rating is 115% and allowance is 15%.

(8 marks)

Question 8

a) State and explain two (2) advantages and two (2) disadvantages of using
   Predetermined Time System in obtaining time standard.

(8 marks)

b) Determine the standard time (in seconds) for the task in Table 3. The allowance to be
   given is 12%.

(12 marks)

Table 3: Part X process sequences

Activities	Left hand	TMU	Right hand	Activities
Reach 30 cm to bin for part	R30C	14.1		
Grasp part	G4B	9.1		
Move part 26 cm to fixture	M26C	13.7		
Position part in fixture	P2SE	16.2		
		10.5	R22B	Reach 22 cm to part in fixture
		2.0	G1A	Grasp part
		11.2	M22B	Move part 22 cm to disposal chute
		2.0	RL1	Release part

Question 9

A worker is assigned to sew two (2) types of trousers, primary and secondary school. Observations were made for 5 work shifts. Total time per shift (exclusive of rest periods) is 6.5 hours. Total outputs at the end of the study are 107 primary school trousers and 98 secondary school trousers. Figure 1 shows the preliminary data collected and Table 4 shows the observations on rating. The total amount of allowances the worker is entitled to is 15%.
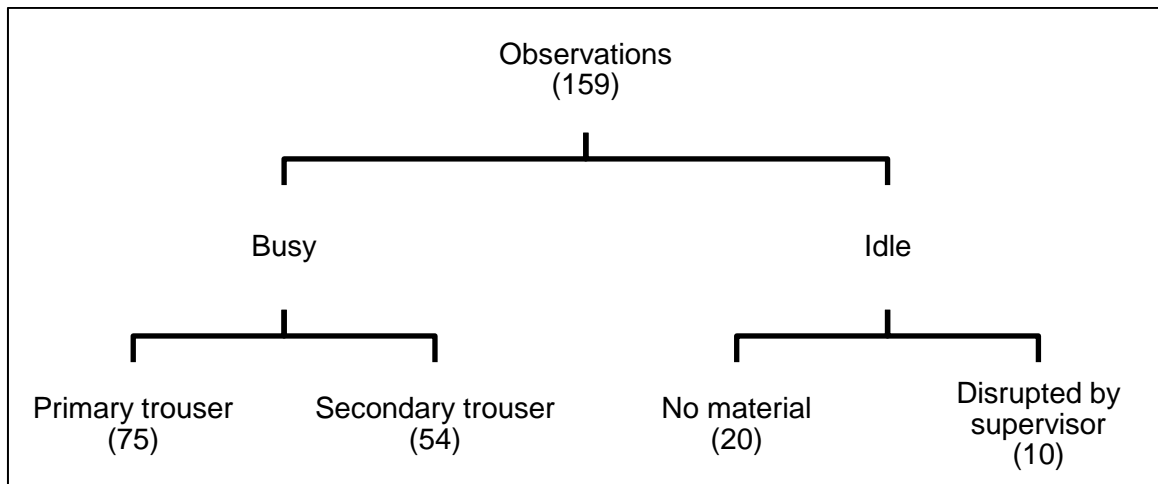
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                          Observations
                             (159)
         ┌───────────────────────┴───────────────────────┐
        Busy                                            Idle
   ┌──────┴──────┐                              ┌──────────┴──────────┐
Primary trouser   Secondary trouser        No material      Disrupted by
    (75)               (54)                    (20)           supervisor
                                                                (10)
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Figure 1: Preliminary data collected, in bracket is the frequency value

Table 4: Rating observation

Rating (%)	90	95	100	105	110	115
Frequency	9	28	48	20	15	9

a) At 95% confidence level, calculate the error with the available data if both trousers are to be considered.

(10 marks)

b) Based on your answer for Question 9 (a), assume that the error is acceptable. Calculate the standard time for both trousers.

(10 marks)

Appendix A

Percentage Points of the *t* Distribution

	Probability *P*												
n	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.05	0.02	0.01	0.001
1	0.158	0.325	0.510	0.727	1.000	1.376	1.963	3.078	6.314	12.706	31.821	63.657	636.619
2	0.142	0.289	0.445	0.617	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	31.598
3	0.137	0.277	0.424	0.584	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	12.941
4	0.134	0.271	0.414	0.569	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	8.610
5	0.132	0.267	0.408	0.559	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	6.859
6	0.131	0.265	0.404	0.553	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.959
7	0.130	0.263	0.402	0.549	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	5.405
8	0.130	0.262	0.399	0.546	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	5.041
9	0.129	0.261	0.398	0.543	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.781
10	0.129	0.260	0.397	0.542	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.587
11	0.129	0.260	0.396	0.540	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.437
12	0.128	0.259	0.395	0.539	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	4.318
13	0.128	0.259	0.394	0.538	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	4.221
14	0.128	0.258	0.393	0.537	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	4.140
15	0.128	0.258	0.393	0.536	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	4.073
16	0.128	0.258	0.392	0.535	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	4.015
17	0.128	0.257	0.392	0.534	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.965
18	0.127	0.257	0.392	0.534	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.922
19	0.127	0.257	0.391	0.533	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.883
20	0.127	0.257	0.391	0.533	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.850
21	0.127	0.257	0.391	0.532	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.819
22	0.127	0.256	0.390	0.532	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.792
23	0.127	0.256	0.390	0.532	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.767
24	0.127	0.256	0.390	0.531	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.745
25	0.127	0.256	0.390	0.531	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.725
26	0.127	0.256	0.390	0.531	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.707
27	0.127	0.256	0.389	0.531	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.690
28	0.127	0.256	0.389	0.530	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.674
29	0.127	0.256	0.389	0.530	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.659
30	0.127	0.256	0.389	0.530	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.646
40	0.126	0.255	0.388	0.529	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.551
60	0.126	0.254	0.387	0.527	0.679	0.848	1.046	1.296	1.671	2.000	2.390	2.660	3.460
120	0.126	0.254	0.386	0.526	0.677	0.845	1.041	1.289	1.658	1.980	2.358	2.617	3.373
∞	0.126	0.253	0.385	0.524	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576	3.291

Source: Reprinted from Table III of R. A. Fisher and F. Yates. *Statistical Tables for Biological, Agricultural, and Medical Research* (Edinburgh: Oliver & Boyd, Ltd.), by permission of the authors and publishers.

Note: Probabilities refer to the sum of the two tail areas: for a single tail, divide the probability by 2.

END OF QUESTION