First Semester Examination
2023/2024 Academic Session

Februari 2024

EPE 481 – Industrial Ergonomics
(Ergonomik Industri)

Duration: 3 hours
(Masa: 3 jam)

Please check that this examination paper consists of FIVE (5) pages of printed material before you begin the examination.

[Sila pastikan bahawa kertas peperiksaan ini mengandungi LIMA (5) muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]

Instructions : Answer **ALL FIVE (5)** questions.

*[**Arahan** : Jawab **LIMA (5)** soalan]*

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1. Table 1 shows the height and weight measurements for ten final-year students in the School of Mechanical Engineering. By referring to the table,

Table 1

Student	Gender	Height (cm)	Weight (kg)
Student 1	Male	165	72
Student 2	Male	170	88
Student 3	Male	185	75
Student 4	Male	171	65
Student 5	Male	169	80
Student 6	Male	154	76
Student 7	Female	154	65
Student 8	Female	164	55
Student 9	Female	160	79
Student 10	Female	170	86

[a] Compare the 5^{th} percentile of height between male and female students.

(35 marks)

[b] Compare the 95^{th} percentile of weight between male and female students.

(35 marks)

[c] Suggest THREE (3) considerations of ergonomic classroom layout so they can fit all.

(30 marks)

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2. [a] (i) By referring to Figure 2[a](i), do you agree with the statement "*Whenever possible, push a load instead of pulling it?"*. Support your decision with THREE (3) justifications.

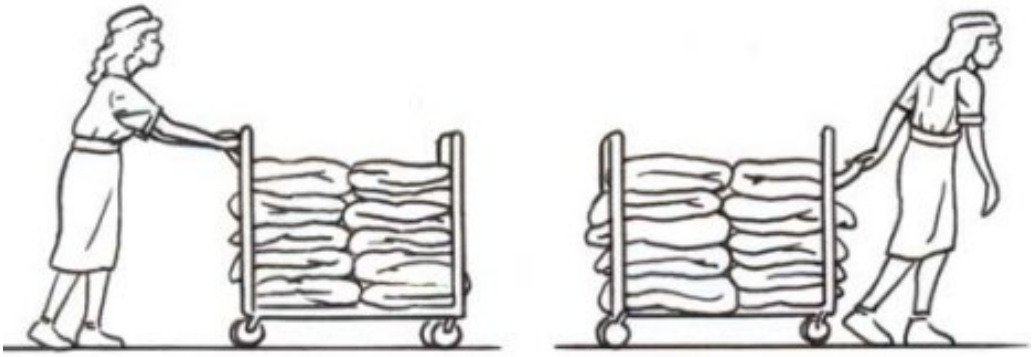

Figure 2[a](i)

(30 marks)

(ii) Suggest TWO (2) postures for pushing heavy objects.

(20 marks)

[b] Workplace design comprises five elements: task requirements, workplace components, working person, body posture, and environment.

(i) Illustrate the interdependences of these five workplace design elements.

(10 marks)

(ii) Choose a specific occupation as a case study and construct a workplace design that integrates these five elements.

(40 marks)

3. [a] Discuss the importance of considering workers in varying climate environments, including hot and cold conditions, in the context of ergonomics.

(20 marks)

[b] Compare TWO (2) working conditions of the worker in a company that applies and does not apply work-rest regime in the climate environment.

(40 marks)

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[c] In industrial settings with high noise levels, suggest FOUR (4) ergonomic measures that can be implemented to minimize auditory stress, to enhance worker communication, and to ensure safety and comfort.

(40 marks)

4. [a] Assess THREE (3) similar conditions for visual and auditory communication to be acceptable.

(30 marks)

[b] Design TWO (2) components each by giving ONE (1) recommendation and ONE (1) suggestion to satisfy the ergonomics and industrial safety features.

(i) Static and dynamic controller in airplane cockpit.

(20 marks)

(ii) Traditional Automotive Displays Control (ADC) and current Adaptive Cruise Controller (ACC) panel.

(20 marks)

[c] Discuss THREE (3) criteria whereby ergonomics intervention in visual setting is important for safety usage.

(30 marks)

5. [a] Evaluate a model of Human Machine interaction (HMI) in a complex process control and correlate the HMI in display and control system.

(20 marks)

[b] Triangulation between Human Computer Interaction (HCI) with Human Machine Interaction (HMI) and Human Factor Engineering (HFE) have been debated during this decade due to digitalization transformation in Industrial Revolution 4.5 (IR4.5). The industry must also comply with Occupational Safety and Health (OSH) standards. Give your view on the debate related to the macro-ergonomics especially in current national automotive industry using all the ergonomics elements mentioned.

(50 marks)

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[c] The implementation usage of remote monitoring of robotic arm for operating patient has long been delayed in many countries mainly due to the risk and hazard involved and the compliance to the remote monitoring policy. Hence, a comprehensive system needs to be re-designed to optimize machine artificial intelligence and human capabilities. As an engineering consultant, you are assigned to solve the problem by stating THREE (3) main principles to ensure the diagnostic tasks by human machine are aligned effectively.

(30 marks)

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