



First Semester Examination
2021/2022 Academic Session

February/March 2022

EPE421 – Ergonomic and Industrial Safety

Duration : 3 hours

Please check that this examination paper consists of SIX [6] printed pages before you begin the examination.

INSTRUCTIONS : Answer **ALL FOUR [4]** questions.

In the event of any discrepancies, the English version shall be used.

1. [a] (i) Define ergonomics from the viewpoint of manufacturing engineering.
- (ii) Explain the situation for manufacturing operator if their working space was not designed with ergonomics view. (20 marks)
- [b] Static and dynamic data is two main types of anthropometrics data.
- (i) State TWO (2) body dimensions for each type of anthropometrics data.
- (ii) Explain the answers in [a](i) with the aid of illustration. (30 marks)

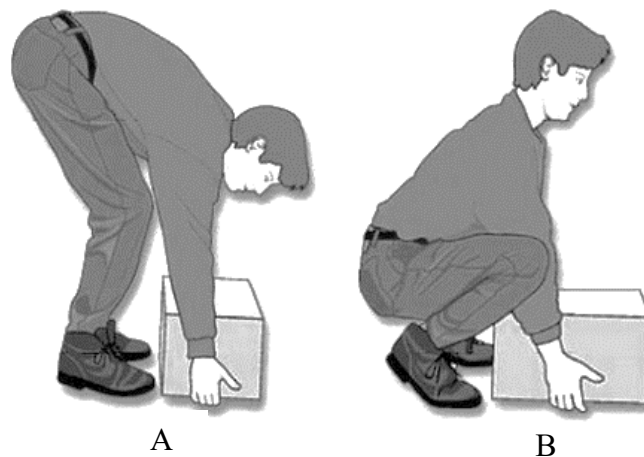


Figure 1[c]

- [c] Figure 1[c] shows the postures of two workers to lift a box. Worker A complained of back discomfort after a lengthy period of lifting, however Worker B did not.
- (i) Identify TWO (2) occupations requires for prolong lifting.
- (ii) Explain why Worker A felt back discomfort compared to Worker B.
- (iii) Suggest FOUR (4) techniques for proper lifting so that the workers can increase their productivity dan improve safety.

(50 marks)

...3/-



Figure 2[a]

2. [a] Ali's company encouraged the employees to work from home until the COVID-19 outbreak had subsided. Figure 2[a] shows the layout of a home office, which comprises computer equipment and office furniture.

- (i) Identify THREE (3) potentially uncomfortable working practices and health problems will be faced by Ali related to the use of current setup.
- (ii) Suggest the solution for each problem mentioned in 2[a](i) with the aid of illustration.

(50 marks)

- [b] You are employed to design the placement of furniture of the kitchen for a client. You have the luxury to tailor-made furniture. The furniture is kitchen worktop (0.5m by 2m), top and bottom cabinets (0.5m by 3m) and dining table (1m by 2m). The dimension of the kitchen is 3m by 3m.

For each type of furniture:

- (i) Sketch the arrangement of the furniture in the kitchen. (Plan view)
- (ii) Specify all dimensions of the anthropometric data and its type that you will use in the design.
- (iii) For all the dimensions you specified, state the percentile used and the gender.

(50marks)

...4/-

3. [a] In Red Deer, a carpenter is working outside on a -26°C in February on a building under construction on the 9th floor. The radio reports a general wind chill of 27. On the ninth floor, the wind is blowing between 20 and 25km/h (about 15mph). Wind is blowing from a side that has support beams (but no walls). Carpenter needs to work without gloves. The work involves moderate physical activity. Crew has worked at this location at least 2 months.
- (i) Identify the number of breaks and the maximum work period for the carpenter to stay productive in four-hour shift.
 - (ii) Suggest TWO (2) methods for each type of control that can be done for the carpenter to maintain work productivity in terms of elimination/substitution, engineering and administrative control.

(50 marks)



Figure 3[b]

- [b] (i) Identify TWO (2) different types of displays and provide TWO (2) examples of each.
- (iii) Specify TWO (2) issues that consumers will have with the displays of the four-burner stove shown in Figure 3[b].
- (iv) With the use of illustrations, suggest solutions to the issues raised in 3[b].

(50marks)

...5/-

4. [a] Torsion during hip external rotation and extension may explain why acetabular labral tears occur in professional athletes. The article "Mun F, Suh SW, Park HJ, Choi A. Kinematic relationship between rotation of lumbar spine and hip joints during golf swing in professional golfers" (Biomed Eng Online. 2015 May 14;14:41. doi: 10.1186/s12938-015-0041-5. PMID: 25971396; PMCID: PMC4430877.) reported on an investigation in which led hip internal peak rotational velocity and trailing hip peak external rotational velocities were determined for 15 golfers. The procedures of thigh kinematics development of the anatomical systems of thigh segment and knee joint section were illustrated in the Figure 4.

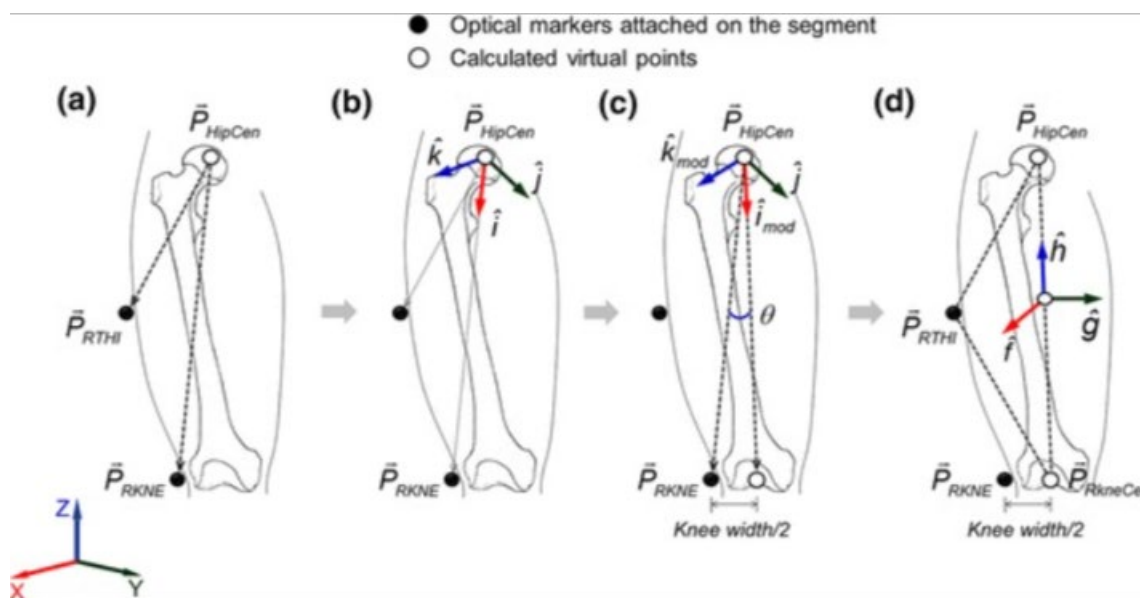


Figure 4

- (i) Analyze the TWO (2) most probable safety procedure for low back-pain and injury suffered by the golfers if the players using backswing and downswing. (10marks)
- (ii) Explain THREE (3) activities during golfing that would improve the swing control and at the same time would minimize the low back pain. (20 marks)
- (iii) In order to eliminate the knee pain, describe ONE (1) alternative posture that is appropriate to control the injury. (20 marks)

...6/-

- [b] In an industrial work place, temperature is set at ambient temperature and natural sunlight is used.
- (i) Select FOUR (4) variables used in defining the environment climate.
(4 marks)
- (ii) Propose the actions needed to be carried out if the environmental climate were not conforming to the specifications regulated by National Institute for Occupational Safety and Health (NIOSH), Malaysia.
(20 marks)
- (iii) State THREE (3) negative effects to workers if the temperature and lighting is extremely unsuitable.
(6 marks)
- (iv) Design TWO (2) concepts to be used in workplace assembly in microchip component from the aspect of
- Lighting for the Quality Assurance lab
 - Physical thermal comfort at the operational line
- (20 marks)