



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2017/2018**

COURSE NAME : PRINCIPLE OF PHYSIOLOGICAL DEVICES
COURSE CODE : BEU 30203
PROGRAMME CODE : BEJ
EXAMINATION DATE : JUNE / JULY 2018
DURATION : 3 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

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THIS QUESTION PAPER CONSISTS OF **THREE (3) PAGES**

Q1 (a) A cardiac output can be determined according to a measurement of O₂ concentration using indicator-dilution method. Basically, there are two methods used in the indicator-dilution.

(i) Classify the **TWO (2)** methods. (6 marks)

(ii) Describe Fick technique to measure the cardiac output. (3 marks)

(iii) Using a mathematical formula, derive an equation to calculate the cardiac output based on the Fick technique. (3 marks)

(iv) Based on the Fick technique, calculate the cardiac output [L/min] if spirometer O₂ consumption is 200 mL/min, arterial O₂ content is 150 mL/L and venous O₂ content is 100 mL/L (4 marks)

(b) Deduce the existing plethysmography methods that used to find a blood volume for a blood flow measurement. (9 marks)

Q2 (a) (i) Give a definition of a blood pressure. (2 marks)

(ii) Describe **TWO (2)** readings that are essential in the blood pressure measurement. (4 marks)

(b) Discover the concept of balancing the pressure in a cuff of a sphygmomanometer against the pressure in the artery in measuring the blood pressure. (6 marks)

(c) Generalise the working principle of Doppler Ultrasonic Sphygmomanometer in determining the blood pressure. (6 marks)

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- (d) Illustrate the heart rate measurement setup by photoplethysmography (PPG).
(4 marks)
- (e) A thermometer is a device in which a property that changes with temperature is measured and used to indicate the value of the temperature. Describe the types of thermometer that are commonly used in daily life.
(3 marks)

- Q3** (a) Transducer is a device that converts energy into a corresponding signal with a different energy form. It takes form of a sensor and an actuator.
- (i) Elaborate the differences between a sensor and an actuator.
(8 marks)
- (ii) Potentiometer is the simplest linear displacement transducer to form an adjustable voltage divider. With the aid of a diagram, explain the operating principle of a potentiometer.
(9 marks)
- (b) The piezoelectric effect is understood as the linear electromechanical interaction between the mechanical and electrical state in crystalline substantial. Summarise the electromechanical nature of piezoelectric material.
(8 marks)

- Q4** (a) Explain the basic function of Biopotential Amplifier.
(4 marks)
- (b) Medical imaging instrumentation is a technology created to visualize interior of a body for clinical analysis and medical intervention, as well as visual representation of the function of some organs or tissues (physiology). These technologies normally involved interfacing of a computer with the medical instrumentation.
- (i) List down **THREE (3)** types of medical imaging instrumentation.
(6 marks)
- (ii) In your words, briefly explain the differences between the operating principle of imaging systems listed in Q4(b)(i).
(15 marks)

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-END OF QUESTIONS -