



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

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

COURSE NAME : PRINCIPLE OF PHYSIOLOGICAL DEVICES
COURSE CODE : BEU 30202
PROGRAMME CODE : BEJ
EXAMINATION DATE : JUNE / JULY 2018
DURATION : 2 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

TERBUKA

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

- Q1** (a) Cardiac output can be determined according to a measurement of O₂ concentration.
- (i) Name the general method used in the measurement of O₂ concentration.
(2 marks)
 - (ii) Describe Fick's technique to measure a cardiac output.
(3 marks)
 - (iii) Using a mathematical formula, derive an equation to calculate the cardiac output based on the Fick's technique.
(3 marks)
 - (iv) Based on the Fick's 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) Explain the general concept of plethysmography in measuring a blood flow.
(3 marks)

- Q2** (a) Give a definition of blood pressure.
(2 marks)
- (b) Analyse and explain 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) Illustrate the heart rate measurement setup in photoplethysmography (PPG).
(4 marks)
- (d) A thermometer measures the change of temperature and used to indicate the value of the temperature. Describe the types of thermometer that are commonly used in daily life.
(3 marks)

TERBUKA

- Q3** (a) Transducer is a device that converts energy into a corresponding signal in a different energy form. It takes the form of a sensor and an actuator.
- (i) Identify the difference between a sensor and an actuator. (4 marks)
- (ii) A potentiometer is the simplest linear displacement transducer which is widely used in physiological measurements to form an adjustable voltage divider. With the aid of a diagram, explain the operating principle of the potentiometer. (8 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 functions of a biopotential amplifier. (4 marks)
- (b) Medical imaging instrumentation is a technology created to visualize the 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) By choosing **TWO (2)** of the imaging systems listed in **Q4(b)(i)**, briefly explain the differences of the operating principle between them. (10 marks)

-END OF QUESTIONS -