



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION  
SEMESTER II  
SESSION 2021/2022

COURSE NAME : MEDICAL INSTRUMENTATION

COURSE CODE : BEU40503/BEJ45303

PROGRAMME CODE : BEJ

EXAMINATION DATE : JULY 2022

DURATION : 3HOURS

INSTRUCTION

1. ANSWER ALL QUESTIONS
2. THIS FINAL EXAMINATION IS AN **ONLINE ASSESSMENT AND CONDUCTED VIA OPEN BOOK.**

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

- Q1** (a) The primary purpose of medical instrumentation system is to measure or determine the presence of some physical quantity. It is to aid medical personnels in making diagnosis and treatment. Categorize **TEN (10)** medical device operational modes.  
(10 marks)
- (b) A flowchart can also be defined as a diagrammatic representation of an algorithm, a step-by-step approach to solving a task. Sketch the general design criteria and process flowchart of medical instrumentation system.  
(2.5 marks)
- Q2** (a) Ventilated laboratory workspace for safely working with materials contaminated with pathogens requiring a defined biosafety level. Explain biosafety cabinet.  
(2.5 marks)
- (b) Cellular engineering applies the principles and methods of engineering to the problems of cell and molecular biology of both a basic and applied nature driver attempts. Explain cellular engineering with its categories.  
(10 marks)
- Q3** (a) Usually a transducer converts a signal in one form of energy to a signal in another. Explain about transducer function and its application.  
(6 marks)
- (b) Flexible sensors have the potential to be seamlessly applied to soft and irregularly shaped surfaces such as the human skin or textile fabrics. Describe the functioning of flex sensor.  
(3 marks)
- (c) Force Sensing Resistors (FSR) sensors are devices that allow measuring static and dynamic forces applied to a contact surface. Discuss the effectiveness of the proposed sensors through experiment for the hardness sensing system consists of an interlink FSR sensor.  
(16 marks)
- Q4** (a) An infusion pump is a medical device that delivers fluids, such as nutrients and medications, into a patient's body in controlled amounts. Summarize the operation of infusion pump with its control system block diagram.  
(12 marks)
- (b) Hemodialysis is a treatment to filter wastes and water from human blood. Venous air embolism may arise from 4 possible areas of air entry into the dialysis circuit. Evaluate the circuit with suitable diagram.  
(13 marks)

- Q5** (a) Arterial blood pressure is most commonly measured via a sphygmomanometer, which historically used the height of a column of mercury to reflect the circulating pressure. Blood pressure values are generally reported in millimetres of mercury, though aneroid or electronic devices.
- (i) Classify Invasive and non-invasive blood pressure measurement techniques.  
(4 marks)
  - (ii) State sources of error for invasive and non-invasive measurement.  
(6 marks)
  - (iii) Categorize **FIVE (5)** methods of indirect blood pressure measurement.  
(5 marks)
  - (iv) Discuss **THREE (3)** limitations of non-invasive blood pressure monitor.  
(3 marks)
- (b) A regular ultrasound uses sound waves to produce images, but cannot show blood flow. Explain the application of Doppler ultrasound technique in measuring and monitoring non-invasive measurement of blood flow.  
(7 marks)

**-END OF QUESTIONS –**