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**UTHM**

Universiti Tun Hussein Onn Malaysia

**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
(TAKE HOME)  
SEMESTER II  
SESSION 2019/2020**

COURSE NAME : MEDICAL INSTRUMENTATION  
COURSE CODE : BEU 40503  
PROGRAMME CODE : BEJ  
EXAMINATION DATE : JULY 2020  
DURATION : 3 HOURS  
INSTRUCTION : ANSWERS ALL QUESTIONS  
OPEN BOOK EXAMINATION

THIS QUESTION PAPER CONSISTS OF THREE (3) PAGES

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- Q1**
- (a) Medical Instrument is designed to measure various biomedical and physiological parameters. Point out the general constraints in designing a Medical Instrumentation System. (4 marks)
  - (b) While designing a measurement system for medical applications there are some additional constraints that need to be considered. Point out the additional constraints. (9 marks)
  - (c) Demonstrate the **SIX (6)** types of Medical Instruments with examples. (12 marks)
- Q2** As a medical electronic engineer, produce a specific design idea for a monitoring device in which the design may assist the following problems (rationalise the signaling condition in your suggestion):
- (a) People with Carpal Tunnel Syndrome may have numbness, tingling, weakness, or muscle damage in the hand and fingers. The Carpal tunnel syndrome is a condition in which there is excessive pressure on the median nerve. This is the nerve in the wrist that allows feeling and movement to parts of the hand. (12 marks)
  - (b) Arm rehabilitation process requires the patients to do repetitive physical exercises such as arm inward folding movement. Without knowing their improvement rate may result in loss of interest or de-motivate the patients thus, they may struggle to complete rehabilitation process. (13 marks)
- Q3** Many people think that the blood pressure in the aorta is equivalent to that in the brachial artery. However, there are differences between the central aortic blood pressure and the invasively obtained peripheral blood pressure.
- (a) Explain the difference between Diastolic and Systolic pressure. (5 marks)

- (b) The non-invasive, quantitative measurement of blood pressure was introduced by Riva-Rocci in 1896, and refined by the auscultatory method of Korotkoff in 1905. Demonstrate the principle of auscultatory blood pressure measurement system along with the pressure graph.

(8 marks)

- (c) The human heart has the polarization and depolarization activity according to its mechanical excitation properties. Draw the electrophysiological of heart (electrical event) and point out the PQRST waveforms for each of the specialized heart compartment or muscles as in measurement which produces the Electrocardiography (ECG) signals.

(12 marks)

**-END OF QUESTIONS -**

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