UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2017/2018

COURSE NAME	:	MEDICAL INSTRUMENTATION
COURSE CODE	:	BEU 40503
PROGRAMME	:	BEJ
EXAMINATION DATE	:	JUNE/JULY 2018
DURATION	:	3 HOURS
INSTRUCTION	:	PLEASE **WRITE ALL ANSWERS** ON THIS QUESTIONS BOOKLET. ANSWER **ALL** QUESTIONS.

THIS QUESTION PAPER CONSISTS OF **ELEVEN (11)** PAGES

Q1 (a) Differentiate the following statements:

(i) between instrumentation and biomedical instrumentation.

(3 marks)

(ii) between in vivo and in vitro measurement. Give appropriate example.

(3 marks)

(b) **Figure Q1(b)** shows the block diagram of medical instrumentation system.

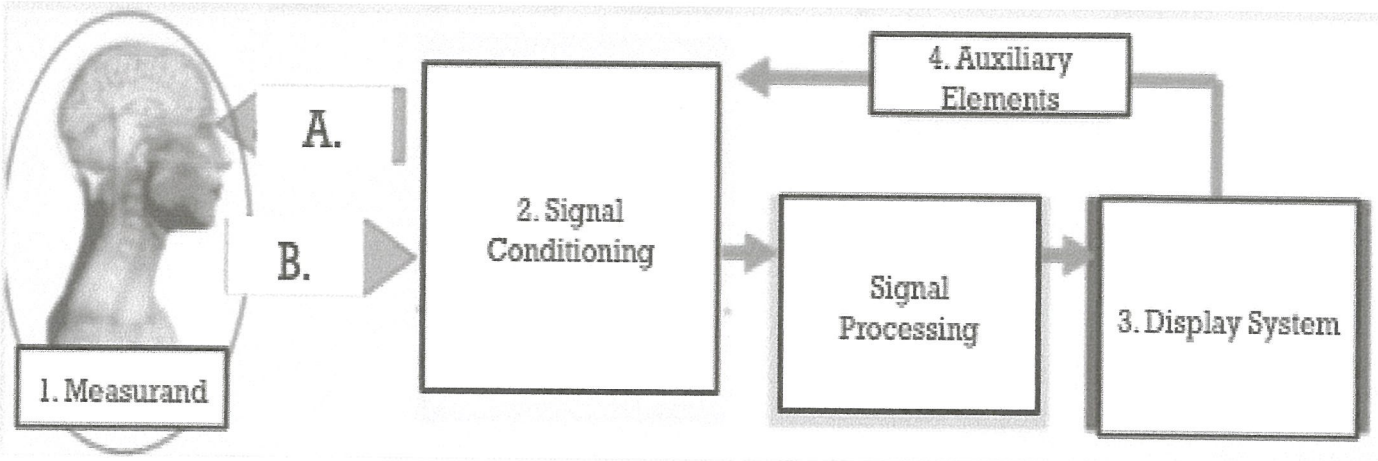

Figure Q1(b)

(i) State A and B.

(2 marks)

(i) Differentiate between transducer and sensor.

(2 marks)

(ii) Analyse the function of measurand, signal conditioning, display system and auxiliary elements.

(7 marks)

(c) When designing a measurement system for medical applications, several general constraints need to be considered. Point out **FOUR (4)** of them.

(8 marks)

Q2 (a) Differentiate the following items:

(i) between flex sensor and force sensor.

(3 marks)

(ii) between accelerometer and gyroscope.

(4 marks)

(b) Give **FOUR (4)** examples of assistive devices that have been developed through rehabilitation engineering.

(8 marks)

(c) Propose **FIVE (5)** impacts of future rehabilitation engineering in improving the quality of individual's life.

(10 marks)

Q3 (a) Classify the statements below:

(i) blood pressure is determined by _____

(1 marks)

(ii) blood pressure varies depending on _____

(2 marks)

(iii) pressure is measured in _____

(1 marks)

(b) **Figure Q3(b)** shows the systemic blood pressure.

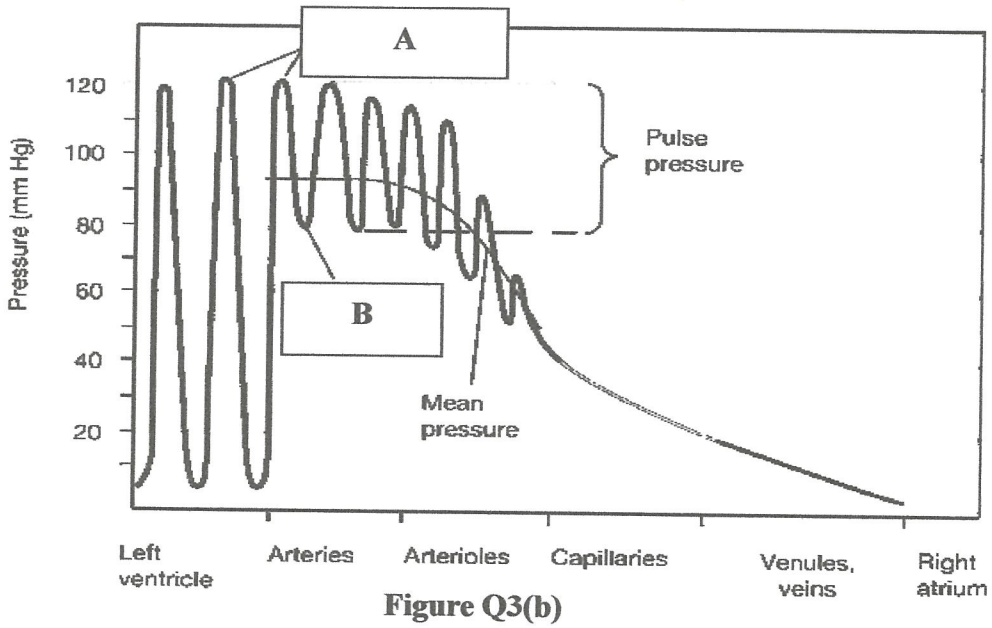

Figure Q3(b)

(i) Label A and B.

(2 marks)

(ii) Differentiate between A and B.

(3 marks)

(iii) Categorize the techniques involving blood pressure measurement. Give an example for each technique.

(4 marks)

(c) Pulse oximeter is a diagnostic device that can detect hypoxia; a condition when the brain and body receives too little oxygen. It is based on the principle of differences in light absorption characteristics of oxygenated and deoxygenated hemoglobin.

(i) Indicate **TWO (2)** vital signs that this device is able to measure.

(2 marks)

(ii) Point out **THREE (3)** physical properties that the amount of light absorbed will depend on. Support your description by using appropriate illustration.

(10 marks)

Q4 (a) The human heart has the polarisation and depolarisation activity according to its mechanical excitation properties.

(i) Draw the electrophysiological of heart (electrical event) and label the PQRST, PR interval, ST interval and QT interval.

(5 marks)

(ii) Based on the ECG signal drawn in **Q4(a)(i)**, analyse the generation of P wave, QRS complex, PR interval and QRS duration based on depolarisation activity of the heart.

(8 marks)

(b) Respiration rate is the number of breaths taken within a set amount of time. Discover **FOUR (4)** methods of measuring respiratory rate.

(12 marks)

– END OF QUESTIONS –