UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2016/2017

TERBUKA

COURSE NAME	:	BIOMEDICAL ENGINEERING AND APPLICATIONS
COURSE CODE	:	BEU 41503
PROGRAMME	:	BEJ
EXAMINATION DATE	:	JUNE 2017
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS AND THIS QUESTION PAPER MUST BE **RETURNED**

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

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Q1   (a)   Identify **THREE (3)** workplaces and job descriptions where one can practice biomedical engineering.

(6 marks)

       (b)   Provide **TWO (2)** benefits of joining a biomedical engineering professional society.

(4 marks)

Q2   (a)   By giving examples, discuss the evolution of biotechnology from ancient to modern biotechnology.

(8 marks)

       (b)   Researchers have alternatively studied tissue explant cultures due to challenges associated with understanding fundamental mechanisms of cell behavior at the complex, in vivo level. Describe types of cell used in the cell culture.

(6 marks)

       (c)   Analyse how the Atomic-Force Microscopy (AFM) enable to produce a very precise scanning compare to other types of microscopy.

(8 marks)

       (d)   Flow cytometry is a biophysical technology used in biotechnology.

              (i)   Identify the difference between a microscope and a flow cytometer.

(6 marks)

              (ii)   Summarise the operation principle of the flow cytometer.

(8 marks)

Q3   (a)   Surface plasmons are among one of the latest technique used in the development of fast biosensor. Sketch and explain the classical prism based Surface Plasmons systems.

(9 marks)

       (b)   Sketch and explain the newly developed high numerical aperture lens based Surface Plasmons systems.

(9 marks)

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(c) Describe how surface plasmons based system could be used in antigen/antibody binding studies.

(5 marks)

(d) Give at least **THREE (3)** applications in which Surface Plasmons being used.

(4 marks)

Q4 (a) Electroencephalography (EEG) is a technique that reads scalp electrical activity generated by brain structures. The brain activity can be described based on brain wave frequencies. Using your own words, **discriminate** between alpha, beta, theta and delta waves based on **frequency range and specific activities**.

(8 marks)

(b) Although EEG provides less spatial resolution compared to MRI and PET, its greatest advantage is speed. It is able to record complex patterns of neural activity within fractions of a second after stimulus has been administered and hence, EEG has been used in many clinical and research applications involving human and animals. Give **THREE (3)** examples of EEG application.

(3 marks)

(c) Artifacts in EEG signals can cause higher amplitude and different shape in comparison to signal sequences that does not suffer any large contamination. There are two common EEG artifacts sources. **Analyze these two sources** and include **THREE (3)** examples for each artifact source.

(8 marks)

(d) Block diagram in **Figure Q4 (d)** shows an example of the standard EEG instrumentation system. **Fill in the empty blocks (point no. 2 and 4)** with appropriate answers and **briefly analyze the function** of the empty blocks.

(8 marks)

Figure Q4 (d)

– END OF QUESTIONS–