Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2014/2015

COURSE NAME	:	BIOMEDICALS ENGINEERING AND APPLICATION
COURSE CODE	:	BEU 41503
PROGRAMME	:	4 BEJ
EXAMINATION DATE	:	DECEMBER 2014 / JANUARY 2015
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER **ALL** QUESTIONS 2. PLEASE WRITE ALL THE ANSWERS ON THIS QUESTIONS BOOKLET

THIS QUESTION PAPER CONSISTS OF **THIRTEEN (13)** PAGES

Q1 Biotechnology harnesses cellular and biomolecular processes to develop technologies and products that help improve our lives and the health of our planet.

(a) Explain in your own words the definition of cell culture as one of the technologies studied under the biotechnology.

(3 marks)

(b) Culture conditions vary widely for each cell type, but the artificial environment in which the cells are cultured invariably consists of a suitable vessel containing a substrate or medium that supplies basic requirements of the cells that must be maintained in culture. Identify **THREE** (3) basic requirements and point out **TWO** (2) examples for each requirement.

(12 marks)

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(c) In biotechnology, flow cytometry is used to simultaneously measure and then analyze multiple physical characteristics of single particles, usually cells. Explain briefly **THREE** (3) main systems that compose a flow cytometer.

(10 marks)

Q2 Tissue engineering is a study of the growth of new connective tissues, or organs, from cells and a collagenous scaffold to produce a fully functional organ for implantation back into the donor host.

(a) Living cells such as living fibroblasts used in skin replacement play a very important role as engineering materials in tissue engineering. Elaborate the processes involved in cells extraction from tissues, in the case of solid and liquid tissue, respectively.

(10 marks)

(b) Bioartificial windpipe is one of the examples of bioengineered organ that would be a useful tool in cases such as tracheal replacement. Show the steps involved in creating a bioartificial windpipe by considering the combination of cells, scaffolds, bioactive molecules, and other basic requirements that involved in the processes.

(10 marks)

(c) Point out **FIVE** (5) examples of tissue engineering application in addition to the bioartificial windpipe as mentioned in previous question.

(5 marks)

Q3 Rehabilitation engineering is a new and growing specialty area of biomedical engineering that uses engineering science and principles to expand capabilities and improve the quality of life for individuals with physical impairments.

(a) Discuss **TWO** (2) benefits that can be obtained from rehabilitation engineering in order to justify the above-mentioned statement.

(4 marks)

(b) Recommend **FOUR** (4) types of assistive devices that can be developed through rehabilitation engineering. Mention the function of each device in detail.

(16 marks)

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(c) Future rehabilitation engineering research involves the design and development of new, innovative, and more sophisticated assistive devices such as the virtual rehabilitation that can be used for physical and cognitive rehabilitation. Give **ONE** (1) representative method used in virtual rehabilitation and point out **TWO** (2) benefits which can be obtained from that method.

(5 marks)

Q4 Biomagnetism is the phenomenon of magnetic fields produced by living organisms.

(a) Identify **THREE** (3) reasons that can cause the generation of magnetic field in a living organism.

(8 marks)

(b) A superconducting quantum interference device (SQUID) is a mechanism used to measure extremely weak signals, such as subtle changes in the human body's electromagnetic energy field. Illustrate the concept of a SQUID magnetometer by employing Josephson junctions.

(8 marks)

(c) Choose **THREE** (3) measurement systems that employ the SQUID principal to detect signal from human body.

(9 marks)

- END OF QUESTION -