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**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2013/2014**

**COURSE NAME : BIOMEDICAL ENGINEERING  
AND APPLICATION**  
**COURSE CODE : BEU41503**  
**PROGRAMME : BEJ**  
**EXAMINATION DATE : JUNE 2014**  
**DURATION : 3 HOURS**  
**INSTRUCTION : PLEASE WRITE ALL THE  
ANSWERS ON THIS QUESTIONS  
BOOKLET.**

**ANSWER ALL QUESTIONS.**

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

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**SECTION A**

**Q1** 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) Predict **TWO (2)** benefits that can be obtained from rehabilitation engineering in order to support 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)



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

(5 marks)

**Q2** Magnetic nanoparticles offer some attractive possibilities in biomedical engineering and applications.

- (a) Point out **FOUR (4)** physical properties of nanomagnetic materials that make them available for application in the biomedical field.

(8 marks)

- (b) Demonstrate **FOUR (4)** particular applications in biomedical engineering that related to each physical property as have been pointed out in **Q2 (a)**.

(12 marks)



- (c) Summarize the biggest challenges faced in biomedical applications using the magnetic nanoparticles.

(5 marks)

**Q3** Tooth wear is known as a clinical problem that is becoming increasingly important in ageing population.

- (a) Predict the importances of tribology study of dental materials in order to understand the tooth wear behavior.

(4 marks)

- (b) Dental materials can be classified as natural materials, namely human teeth, and artificial materials which are mainly used for dental restorations and implants. Identify **THREE (3)** examples of material that can be classified as artificial materials.

(3 marks)



- (c) For the three types of artificial materials in **Q3 (b)**, point out the advantages and disadvantages that arise in their dental usage. (18 marks)

**Q4** Living cells play a very important role as engineering materials in tissue engineering.

- (a) List down **TWO (2)** examples of the living cells and explain how they are used in tissue engineering.

(8 marks)

- (b) Scaffolds represent important components for tissue engineering, especially for supporting the three-dimensional tissue formation once living cells are implanted into the scaffolds. Give **ONE (1)** example of material and explain **THREE (3)** criteria of the material so that it can be used as tissue engineering scaffold.

(8 marks)

- (c) Point out **THREE (3)** requirements that scaffolds must fulfilled so that they can be used for tissue engineering.

(9 marks)

**- END OF QUESTION -**