



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER I  
SESSION 2015/2016**

COURSE NAME : TELEMEDICINE  
COURSE CODE : BEU 40803  
PROGRAMME : BACHELOR OF ELECTRONIC  
ENGINEERING WITH HONOURS  
EXAMINATION DATE : DECEMBER 2015/JANUARY 2016  
DURATION : 3 HOURS  
INSTRUCTION : ANSWER ALL QUESTIONS  
IN THIS QUESTION PAPER

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

**Q1** (a) Telemedicine can be defined using different terms which are telemedicine, telehealth and telecare.

(i) Differentiate between those three terms used for telemedicine.

(6 marks)

(ii) Draw the connection between all three terms in **Q1(a)**.

(3 marks)

- (b) Recommend factors that influence the rapid development of telemedicine in early 1990s.

(2 marks)

- (c) Analyze the following type of telemedicine by giving **ONE (1)** example of situation related to each term.

- (i) Teleconsultation

(2 marks)

- (ii) Telemonitoring surgery

(2 marks)

- (iii) Telepresence surgery

(2 marks)

- (d) Two non-technological drivers that support the development of telemedicine system are the military application, as well as the home telecare. Justify the above statement.

(4 marks)

- (e) Propose reasons by evaluating why internet is needed to be used wisely in telemedicine.

(4 marks)

**Q2** (a) State **FOUR (4)** examples of biomedical signal which are electrical in nature.

(4 marks)

(b) Noise is the undesired signal components. Analyze **TWO (2)** causes of noise generation.

(4 marks)

- (c) Signal modeling as framework for signal processing can be either in the form of analysis model or synthesis model. Compare between those models by illustrating them in the block diagram form.

(6 marks)

- (d) Explain **TWO (2)** advantages of using digital signal instead of analog signal.

(4 marks)

(e) Before a Clinical Decision Support Systems (CDSS) is put into actual use, it needs to be carefully evaluated, so that its error margins and weaknesses in general are identified and clinicians are informed about them. For classification systems in general, evaluation is typically based on true/false and positive/negative scheme.

(i) Differentiate all schemes available for evaluation of classification system.  
(4 marks)

(ii) Evaluate (in percentage, %) the accuracy, sensitivity and specificity of a classification system if all evaluation schemes are given as below;  
True Positive (TP) = 41  
True Negative (TN) = 46  
False Positive (FP) = 4  
False Negative (FN) = 9

(3 marks)

**Q3** (a) Differentiate between intraBAN and extraBAN.

(4 marks)

(b) Telemedicine for healthcare can also facilitate the general public in maintaining good health in many activities, including for swimming and fitness monitoring for morning jog. Summarize on how to utilize certain devices/sensors related to both activities.

(4 marks)



- (c) Radio Frequency Identification Devices (RFID) is all about identifying an object using radio frequency signals and it has been used in many medical applications. Elaborate how the RFID can be applied at the hospital.

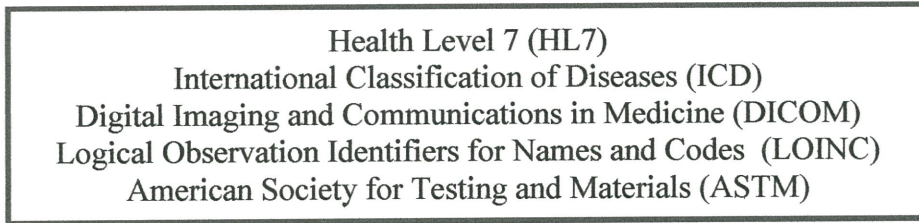
(4 marks)

- (d) Data compression can be categorized in two forms; lossy and lossless. Compare these two forms.

(4 marks)

- (e) For the statement in **Q3 (e)(i) – (v)**, identify the correct standard in the **Figure Q3(e)** below.

(5 marks)



**FIGURE Q3(e)**

- (i) Standard for message exchange about clinical observations, medical logic, and electrophysiologic signals. \_\_\_\_\_
- (ii) Standard for exchanging medical images. \_\_\_\_\_
- (iii) Standard for medical terminologies. \_\_\_\_\_
- (iv) Standard for a set of universal names and codes, clinical observations, and diagnostic study observations. \_\_\_\_\_
- (v) Standard for data interchange. \_\_\_\_\_
- (f) Irrespective of their legal systems, most democratic countries now base their modern practice of patient confidentiality on the three guidelines. Explain any **TWO (2)** of them.

(4 marks)

**Q4** (a) State the **FOUR (4)** pilot applications for telemedicine development in Malaysia.  
(4 marks)

(b) Electronic Health Records (EHRs) is an electronic record of health-related information on an individual that conforms to nationally recognize interoperability standards and that can be created, managed, and consulted by authorized clinicians and staff across more than one healthcare organization.

(i) Discuss why EHRs is needed.

(6 marks)

- (ii) There are four historic constraints to EHR adoption including the need for standardized clinical terminology; privacy, confidentiality and security concerns; challenges to data entry by physicians and difficulties with integrating with other systems. Recall **TWO (2)** other barriers to EHRs adoption.

(4 marks)

- (c) Clinical Decision Support System (CDSS) is one of desirable components in Electronic Health Records (EHR) system.

- (i) Describe the Clinical Decision Support System (CDSS).

(3 marks)

- (ii) There are several applications available for Clinical Decision Support System (CDSS). Explain any **TWO (2)** of them.

(4 marks)

- (d) Personal Health Records (PHRs) is an electronic, universally available, lifelong resource of health information needed by individuals to make health decision, and it is available in two formats. List and explain those two formats.

(4 marks)

– END OF QUESTION –