

University of Ruhuna - Faculty of Technology
Bachelor of Information and Communication Technology Honours Degree
Level 3 (Semester I) Examination, June 2023
Academic Year 2021/2022
Course Unit: ICT3142 – Mobile Computing Principles (Written)

Answer **all four (04)** questions

Duration: 2 hours

IMPORTANT INSTRUCTIONS

- This paper contains **four (04)** questions on four (04) pages.
- The medium of this examination is **English**.
- This is a **closed book** examination.
- Each question carries **equal 100** marks.

1)

- a) “Mobile computing is human–computer interaction by which a computer is expected to be transported during normal usage, which allows for transmission of data, voice and video”. Illustrate the Mobile Computing Model with aid of a suitable diagram.
- b) “Wireless network connectivity is a great way to turn a stationary computing system to a mobile computing system”.
 - i) State **two (02)** basic connection modes of wireless network connectivity and briefly explain them.
 - ii) Distinguish **four (04)** differences between the connection modes stated in part (b)(i).
- c) “The goals set out for third generation (3G) mobile communication were to facilitate greater voice and data capacity and support a wider range of applications”. List down **four (04)** characteristics of third generation (3G) mobile communication.
- d) “GSM is a telecommunication standard which is used to describe the protocols for second generation digital cellular networks used by mobile devices and it comprises of many functional units”.
 - i) Write down **two (02)** main functions of the Mobile Station (MS).
 - ii) Briefly describe the purpose of using “Abis interface” in the Base Station Subsystem (BSS).

- e) "People are tend to be go with mobile computing environment instead of traditional stationary computing environment". Do you agree with this statement? Justify your answer by providing **four (04)** reasons.

2)

- a) Consider the "A" as a mobile node and "X" as a host (server). Server "X" wants to transmit an IP datagram to mobile node "A". But at that moment, the mobile node "A" is not available in its home network and it is available in another foreign network called "B".

- i) Describe the process of sending IP datagram from Server "X" to Mobile node "A".
- ii) Route optimization allows the correspondent node to learn the current location of the mobile node and tunnel its own packets directly. Write down **two (02)** problems which can arise with this route optimization.
- iii) Briefly explain the solution for the problems given in part (a) (ii).

- b) State whether the following statements are **TRUE (T)** or **FALSE (F)**.

- i) Sky-wave propagation is also known as tropospheric propagation as they can travel directly from the earth's surface to the troposphere surface of the earth.
 - ii) A scatternet is a number of interconnected piconets that supports communication between less than 8 devices.
 - iii) Direct Sequence Spread Spectrum (DSSS) is also known as Direct Sequence Code Division Multiple Access (DS-CDMA).
 - iv) Frequency Division Multiple Access (FDMA) is the process of dividing one channel or bandwidth into multiple individual bands, each for use by a single user.
- c) "The Global Positioning System (GPS) is an example for positioning technology in location based services".

- i) State **three (03)** segments of the Global Positioning System (GPS).
- ii) Briefly explain the following terms, "Lock or Fix" and "Time to First Fix".
- iii) "Assisted GPS (A-GPS) can provide more advantages than GPS". Do you agree with this statement? Justify your answer by providing **three (03)** reasons.

3)

- a) "A mobile ad-hoc network consists of set of mobile nodes connected wirelessly in a self configured, self healing network without having a fixed infrastructure".
- i) List down **four (04)** technical challenges in ad-hoc networks.
 - ii) Describe the hidden node problem in wireless networks.
 - iii) Explain the process of solving hidden node problem stated in part (a) (ii).
- b) "A wireless sensor network (WSN) is a wireless network that is designed using spatially distributed self-governing devices that uses sensors for monitoring physical or environmental conditions".
- i) Compare and contrast wireless sensor network (WSN) with wireless ad-hoc network according to the following criteria.
 - A. Size
 - B. Power capacity
 - C. Cost
 - D. Density and redundancy
 - E. Sensing of events
 - ii) State **two (02)** types of Sensor Network Architectures used in Wireless Sensor Network (WSN) and briefly explain **one (01)** of them.
- c) "Orthogonal Frequency Division Multiplexing (OFDM) is a special form of the frequency-division multiplexing (FDM) and multicarrier modulation technique".
- i) Briefly discuss Orthogonal Frequency Division Multiplexing (OFDM) using a real world example.
 - ii) "Orthogonal Frequency Division Multiplexing (OFDM) is more efficient than the frequency-division multiplexing (FDM)". Do you agree with this statement? Justify your answer by mentioning a suitable reason.

- 4)
- a) "Bluetooth is a wireless technology standard for exchanging data over short distances from fixed and mobile devices, creating personal area networks (PANs)".
 - i) Explain the Bluetooth Protocol Architecture with aid of a suitable diagram.
 - ii) Several attacks can be happened to destroy the Bluetooth security. State **three (03)** types of attacks and briefly explain **two (02)** of them.
 - b) "Carrier-Sense Multiple Access with Collision Detection (CSMA CD) and Carrier-Sense Multiple Access With Collision Avoidance (CSMA CA) are media access control protocols".
 - i) Distinguish the main difference between CSMA CD and CSMA CA.
 - ii) Write down **one (01)** advantage and **one (01)** disadvantage of CSMA CA.
 - iii) Briefly describe the term "exponential back off" used in media access control protocols.
 - c) "Terminal Access security is all about ensuring security of the mobile devices. Biometric authentication mechanisms are highly used for it". List down **four (04)** types of them and briefly describe **two (02)** of them.
 - d) "Wired Equivalency Privacy (WEP) and Wi-Fi Protected Access (WPA) are security protocols designed to provide solutions for Wi-Fi network security issues". Distinguish **three (03)** main differences between WEP and WPA.
 - e) "An Attack Vector is a method or technique that a hacker uses to gain access to another computing device or network in order to inject a 'bad code' often called payload". Briefly discuss **three (03)** impacts on your mobile devices due to an Attack Vector.

----- End of the Paper -----