



**University of Ruhuna – Faculty of Technology**  
**Bachelor of Information & Communication Technology Honours Degree**  
**Level 2 (Semester II) Examination – November/December 2025**  
**Academic Year: 2023/2024**

**Course Unit: ICT2252 – Wireless Communication (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 100 marks.**

**Question 01**

**[100 marks]**

a) A university has launched a smart e-learning system where students use mobile devices to access various services of this system. As students move around the university from one place to another, their devices automatically switch between different wireless networks. [30 marks]

- i) Define the term “**Mobility**” based on the given scenario.
- ii) List down **three (03)** types of physical mobility and briefly explain **two (02)** of them.

b) The university provides wireless network connectivity to students to access the services of the e-learning system. Mobile devices connect to another node using wireless network connectivity, which is a key enabler of mobility. [30 marks]

- i) Write down **two (02)** basic connection modes of wireless network connectivity.
- ii) Compare and contrast the basic connection modes stated in Part (b)(i) according to the following criteria:
  - A. Infrastructure
  - B. Cost
  - C. Time of deployment

- c) A Mobile Ad-hoc Network (MANET) consists of a set of mobile nodes that connect wirelessly to form a self-configured and self-healing network.

[40 marks]

- i) List down **three (03)** characteristics of a MANET and briefly explain them.
- ii) Write down **three (03)** advantages of a MANET.
- iii) Define the term "**Vehicular Ad-hoc Network (VANET)**".
- iv) Identify the relationship between MANET and VANET.

**Question 02**

[100 marks]

- a) A modern smart transportation hub integrates WLAN technologies such as Infrared communication technology and Spread Spectrum technology to support seamless data exchange between operational equipment, monitoring systems, and mobile service units throughout the facility.

[40 marks]

- i) List down **two (02)** types of Infrared communication technologies and briefly explain them.
- ii) The transportation hub utilizes Spread Spectrum techniques to spread the transmitted signal over a wider frequency band. Briefly describe the impact on **bandwidth efficiency, reliability, integrity, and security**.
- iii) Write down **two (02)** modulation schemes of Spread Spectrum technology and briefly explain them.

- b) When considering the functions of the transportation hub, transmitted signals often experience multipath propagation resulting in different issues in communication.

[30 marks]

- i) Define the term "**Multipath propagation**".
- ii) Briefly explain how it occurs in the transportation hub.
- iii) Write down **two (02)** impacts on data transmission due to multipath propagation.

- c) The transportation hub uses Frequency Division Multiplexing (FDM) to allow multiple signals to share the same transmission medium. However, adjacent carrier interference can occur as a drawback.

[30 marks]

- i) Define **adjacent carrier interference** and briefly explain how it can occur in FDM systems in the transportation hub.
- ii) Briefly explain the solution to prevent adjacent carrier interference in traditional FDM systems with the aid of a suitable diagram.

### Question 03

[100 marks]

- a) A software company consists of several departments to develop productive deliverables for their clients. There are three departments: "Software Development", "Quality Assurance", and "Marketing", each located in separate buildings with separate wireless networks. Each network consists of a wireless access point (WAP). During peak hours, the network administrator notices various issues such as brief connection drops and reduced data transmission speed.

[40 marks]

- i) Consider two devices 'D1' and 'D2' in the "Software Development" department that want to transmit data concurrently. Briefly explain how the **hidden node problem** can occur in this situation.

ii) Identify a suitable technique to overcome this problem.

iii) Briefly describe the technique mentioned in Part (a)(ii) based on the given scenario.

- b) Consider two devices, 'X' and 'Y', belonging to the "Quality Assurance" and "Marketing" departments respectively. Device 'Y' wants to transmit an IP datagram to device 'X'. However, device 'X' is not available in its home network and is currently connected to the "Software Development" department's network.

[40 marks]

- i) Identify the following elements related to the mobile IP process based on the above given scenario.

- A. Mobile node
- B. Correspondent node
- C. Home network
- D. Foreign network

ii) Define the term "**Care-of Address**" in the mobile IP process.

iii) Describe the process of sending the IP datagram from device 'Y' to device 'X'.

- c) [20 marks]
- i) Define the term "**Flooding**" in wireless data transmission.
  - ii) List down **two (02)** advantages and **two (02)** disadvantages of flooding.

**Question 04** [100 marks]

- a) A large smart logistics warehouse uses wireless communication technologies to automate its inventory tracking and shipment management. Employees use Bluetooth-enabled handheld scanners that automatically connect to nearby devices and barcode transmitters through the standard Bluetooth connection process.

[32 marks]

- i) Describe the steps involved in establishing a Bluetooth connection in the given scenario.
- ii) Distinguish the difference between **hold mode** and **park mode** in Bluetooth communication.
- iii) List down **three (03)** Bluetooth security attacks and briefly explain **two (02)** of them.

- b) Each employee's handheld device forms a piconet. As employees move around the warehouse, scatternets are formed, enabling inventory data transfer across different sections.

[34 marks]

- i) Define the terms "**Piconet**" and "**Scatternet**".
- ii) Write down **two (02)** types of piconets and briefly describe them.
- iii) Identify an example for a piconet and scatternet based on the given scenario.

- c) The warehouse also uses GSM modules integrated into vehicle monitoring units on trucks and delivery vehicles. These modules transmit location data, delivery confirmations, and security alerts to the central warehouse system, enabling real-time tracking over long distances.

[34 marks]

- i) List down **two (02)** parts of the Base Station Subsystem (BSS) and briefly explain them.
- ii) Distinguish the difference between the **Home Location Register (HLR)** and **Visitor Location Register (VLR)**.
- iii) Write down **two (02)** functions of the Operation Support Subsystem (OSS).

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