



UNIVERSITY EXAMINATIONS: 2025/2026
EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN
INFORMATION TECHNOLOGY
BSIT404
MOBILE AND WIRELESS NETWORK
END TERM EXAMINATION

EXAM DATE: MONDAY 15TH DECEMBER 2025 TIME: 2:00PM-4:00PM

DURATION: 2 HOURS

INSTRUCTIONS: Question One is Compulsory, Choose Three Other Questions

SECTION A: Answer all questions

QUESTION ONE (15 marks) Compulsory

- a. Define the following terms as used in telecommunication (2 marks)
 - i. Cell splitting
 - ii. Grade of Service (GOS)
- b. Explain two factors that influence the handoff process (2 marks)
- c. Diversity helps to stabilize a link and improves performance by providing the receiver with multiple versions of the same signal. Explain two diversity techniques in existence. (2 marks)
- d. Compare between LTE and Advanced-LTE features (2 marks)
- e. A cellular service provider decides to use a digital TDMA scheme which can tolerate an SIR of 15 dB in the worst case. Assume $n = 4$ and consider trunking efficiency.
 - i. Find the optimal value for N for omni-directional antennas, 120° sectoring antennas, and 60° sectoring antennas (3 marks).

- f. An engineer is designing a communications link at 3 GHz where the receiver sensitivity is such that $1\mu W$ of power is needed to overcome receiver noise. The receiving antenna gain is 8dB, the transmitter antenna gain is 10dB, the transmitting power level is 25 Watts, and the distance between the two antennas is 1km. Will the communications link work (4 marks)?

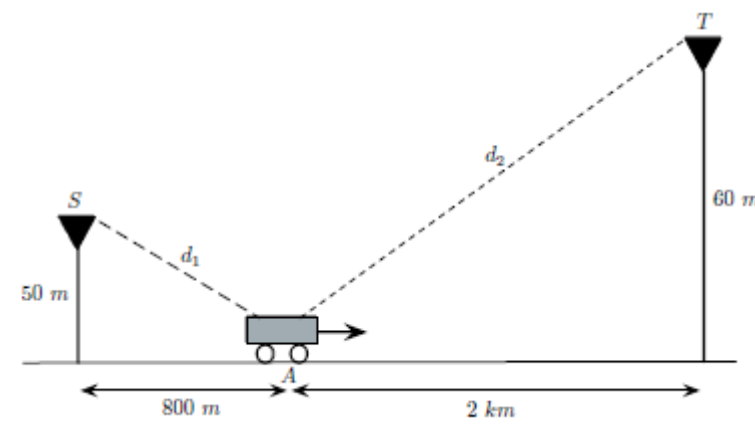
SECTION B (Answer any three)

QUESTION TWO (15 marks)

- Explain any two reasons why routing protocols designed for wired networks are not used in Adhoc wireless networks (2 marks)
- Discuss three basic communication access technologies (3 marks)
- Using typical examples, briefly explain the application of mobile computing in the following areas. (6 marks)
 - Vehicles
 - Medical
 - Law enforcement
- For a certain cellular system, the allocated spectrum is 20 MHz and a 30 KHz channel spacing is used for uplink and downlink separation. The reuse ratio for this system is 7, and the cluster of cells is duplicated 10 times. Find the number of simultaneous communications that can be supported by each cell (4 marks).

QUESTION THREE (15 marks)

- Consider a mobile user driving his car at a constant speed of 72 km/hr . Initially, his traffic was serviced by base station S. Assume that the only other available base station, denoted T, is located 2.8 km from S. The minimum power level needed to maintain an acceptable voice quality is equal to 1.4×10^{-18} W. Take $P_0 = 10^{-12}$ W at $d_0 = 1$ m, and $n = 2$.



- If a handoff request is sent at position A, find the P_r , HO and Δ (3 marks).
- Let B be the position of the car once the handoff has been accomplished. The power received by the mobile user from T at position B is 0.69×10^{-18} W. Find the time t needed to complete the handoff (3 marks).

- b. Discuss two channel Assignment Strategies used in cellular communication (6 marks)
- c. Design a hypothetical experiment to measure path loss L_s , at frequencies $f_1 = 30$ MHz and $f_2 = 60$ MHz, when the distance between the transmitter and receiver is 100 Km. Find the effective area of the receiving antenna, and calculate the path loss in decibels for each case (3 marks).

QUESTION FOUR (15 marks)

- a. As a network engineer at PAC University, you have been tasked to design a large-scale Wireless LAN within the town campus. Discuss any four factors that you need to consider while coming up with a successful wireless infrastructure. (9 marks)
- b. Compare and contrast between the following wireless communications technologies. (6 marks)
 - i. WiMAX and Wi-Fi
 - ii. Zig bee and Bluetooth

QUESTION FIVE (15 marks)

- a) With reference to mobile IP ver 4. Explain how a message sent from one station is received by a mobile node, which may or may not be in its home network. (5 marks)
- b) WiMAX was a great 4G technology. Why was it preferred? (4 marks)
- c) Discuss three advantages of cellular systems with multiple small cells over few large cells (6 marks)

QUESTION SIX (15 marks)

- a) Discuss the significance of IMEI and SIM registration policies in preventing mobile crime and fraud. (4 marks)
- b) A mobile operator wants to deploy Wi-Fi 6 (802.11ax) hotspots nationwide. Explain the regulatory and standards-based requirements they must comply with (frequency, power limits, device certification, security standards, etc.). (6 marks)
- c) A city wants to implement public smart-city Wi-Fi. Outline the policy framework covering privacy, data retention, authentication, and encryption standards. (5 marks)