UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2020/2021

COURSE NAME	:	WIRELESS AND MOBILE COMMUNICATION
COURSE CODE	:	MEP 10503
PROGRAMME CODE	:	MEE
EXAMINATION DATE	:	JULY 2021
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS **OPEN BOOK EXAMINATION**

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

Q1 (a) Celcom engineer is measuring a cellular system at a base station. If a signal-to-interfrence ratio of (First student id no. And Second last student id no.) dB is required for satisfactory forward channel performance of a cellular system, what is the frequency reuse factor and cluster size that should be used for maximum capacity if the path loss exponent is :-

(i) n = 5,

(5 marks)

(ii) n = 2

(5 marks)

Assume that there are six co-channel cells in the first tier and all of them are at the same distance from the mobile device. Use suitable approximations.

(b) Maxis decided to setup a new base station in Batu Pahat. Given the following geometry in **Figure Q1(b)**. Design :
(i) the loss due to knife-edge diffraction,

(5 marks)

(ii) the height of the obstacle required to induce (Last student id no.)dB diffraction loss. Assume f = 950M Hz.
Show your new layout design after modification base on **Figure Q1(b).**

(5 marks)

(c) You are appointment as head project for a cellular system. Find the median path loss using Okumura's model for d = 65km, h_{te} = 200m, h_{re} = (First student id no. And Second last student id no.) m in a suburban environment. The measurement at base station transmitter radiates an EIRP of 5kW at a carrier frequency of 1100 MHz, formulate the power at the receiver. (assume a unity gain receiving antenna)

(5 marks)

Q2 (a) You are serving as a system designer in a telco company. You are required to provide a real-time communication system operating within an available bandwidth of 2400 Hz over an adaptive white Gaussion noise (AWGN) channel.

(i) The required data rate and the available E_b/N_o are 9600 bps and 14 dB, respectively. You are allowed to choose one modulation types for the system, either 8-FSK or 16-QAM. Verify using appropriate calculation that your choice is able to achieve the desired bandwidth requirements.

(4 marks)

(ii) Based on your modulation choice in **Q2 (a)(i)**, prove that the system could attain slower signaling rate.

(5 marks)

(iii) The probabilty of error, P_e attained by the system is 10^{-4}. As the system design engineer you are given the task to reduce the P_e to10^{-6}. Solve the problem.

(4 marks)

(b) Energy-efficient wireless network, which emphasize energy efficiency as well as spectrum efficiency , have been proposed as an effective solution and are becoming the mainstream for future wireless network design. Consider the downlink of a single cell Orthogonal Frequency Division Multiple Access (OFDMA) network consisting of K mobile users. The total bandwidth B is equally divided into N subcarriers.

(i) Identify **TWO (2)** types of diversities available in the network.

(2 marks)

(ii) Discuss the relationship between spectrum-efficient and energy-efficient designs.

(10 marks)

- END OF QUESTIONS -

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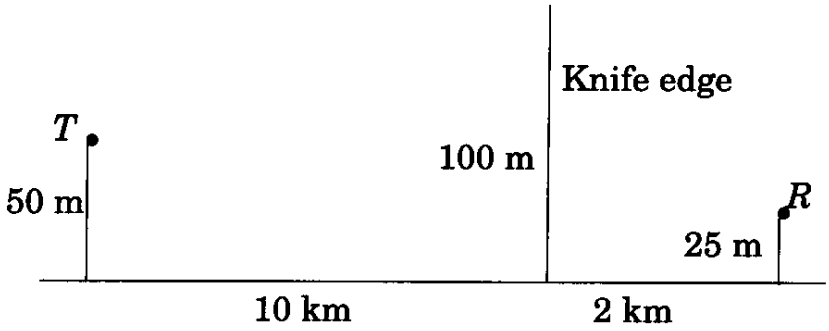

Figure Q1(b): Geometry of a new Maxis base station