Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2018/2019

COURSE NAME	:	NETWORK TECHNOLOGY
COURSE CODE	:	BNF 32603
PROGRAMME CODE	:	BNF
EXAMINATION DATE	:	JUNE / JULY 2019
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

Q1 (a) Provide **THREE (3)** detailed justifications for the statement below.

"Digital communication is the preferred method of transmission by the telecommunication companies"

(6 marks)

(b) A wireless link is known to have a loss of 20 dB. The input signal power is measured as 0.5 W and the output noise level is measured as 4.5 μW.

(i) Calculate the output power in Watt.

(ii) Calculate the output signal-to-noise ratio in dB.

(iii) Given the link transmit the digital signal and utilizes 20 kHz of bandwidth. Calculate the capacity of the wireless link.

(6 marks)

(c) A user subscribed to a mobile broadband service with channel capacity of 20 Mbps, the channel bandwidth allocated to the user is 1 MHz.

(i) Assuming white thermal noise, calculate the required signal-to-noise ratio in order to achieve this capacity. Provide the final answer in dB.

(ii) Channel capacity is the maximum theoretical limit. However, as a practical matter, better error performance will be achieved at a lower data rate. Assume data rate of 3/5 the maximum theoretical limit is chosen. Determine the number signal levels needed to achieve this data rate.

(8 marks)

Q2 (a) State and differentiate between **TWO (2)** types of error in digital transmission

(4 marks)

(b) Crucial data are stored in 1.4 Mbyte floppy diskettes that weigh 30g each. Suppose that 3 different airplanes carries 5300 kg of these floppies each at a speed of 980 km/h over a distance of 5000 km, 2000km and 3000km respectively. Calculate the average data transmission rate of this system (in bits per second).

(4 marks)

(c) A digital wireless network transmitted at 25 Mbps. However, there occurs an impulse noise of 1 μs.

(i) Determine number of error bits in this transmission.

(ii) Calculate number of error bits if the network data rate is increased to 50 Mbps

(iii) Propose an error detection method for this type of error.

(6 marks)

(d) Two communicating devices are using a single-bit even parity check for error detection.

(i) This data transmission has two start bit of '11' and four stop bits of '1010'. If the transmitted data is 10010101, generate the complete data frame.

(3 marks)

(ii) The received data frame with start and stop bits as in question **Q2(d)(i)** is given by 111101011101010. Determine whether the receiver will be able to detect the error. Justify your answer.

(3 marks)

Q3 (a) State the definition of circuit switching and packet switching.

(2 marks)

(b) Describe **TWO (2)** advantages and **TWO (2)** disadvantages of circuit switching.

(4 marks)

(c) In a single Space Division Switch (SDS), only 25% of the crosspoints are being used when all connections are utilized. Multistage switch can be implemented to improve the crosspoints usage. Assume 10 inputs and 10 outputs SDS:

(i) Design a single SDS and a 3-stage SDS with input and output divided into 2 groups.

(8 marks)

(ii) Compare the number of crosspoints between single SDS and 3-stage SDS in percentage.

(2 marks)

(d) Non-blocking switched network is suitable for data transfer. Justify this statement.

(4 marks)

Q4 (a) TDM and FDM are the most fundamental and widely used multiplexing methods used in transmission.

(i) Define TDM and FDM.

(2 marks)

(ii) Describe the main difference between TDM and FDM.

(4 marks)

(iii) Illustrate TDM and FDM using 3-dimensional bar graph.

(2 marks)

(b) A character-interleaved TDM is used to combine the data streams of a number of 9 character per second asynchronous terminals for data transmission over a 3 kHz digital line with SNR of 0.07. Each terminal sends asynchronous characters consisting of 7 data bits, 1 parity bit, 2 start bit, and 4 stop bits. Assume that 5% of the line capacity is reserved for pulse stuffing to accommodate speed variations from the various terminals.

(i) Determine the data rate per terminal and line capacity in bit per second.
(3 marks)

(ii) Determine the number of terminals that can be accommodated by the multiplexer.
(3 marks)

(iii) Sketch a basic diagram showing this multiplexer.
(2 marks)

(c) ADSL is designed to provide high-speed transmission over ordinary telephone wire.

(i) Compare the types of data and the types of signal employ in ADSL.
(2 marks)

(ii) Discuss the advantage of using ADSL compared to wireless communication.
(2 marks)

Q5 (a) Consider a fifth generation cellular network (5G) is being implemented in urban area in Malaysia. Discuss the network topology (base station placement) and other enabling technologies that can be employ in order to ensure high quality connectivity for large number of users.
(6 marks)

(b) A military General is required to design a communication network solution to simultaneously control multiple military grade unmanned air vehicle (UAV) for reconnaissance purpose at long distance.

(i) Assume the military base is located in Parit Raja. The military need to conduct a reconnaissance in Batu Pahat and Kuala Lumpur area. Suggest types of communication link that can be used for reconnaissance in Batu Pahat and Kuala Lumpur. Compare and justify your answer.
(4 marks)

(ii) There are 5 UAVs designed to simultaneously transmit real-time visual information covering wide range of area. The information is transmitted to the military base via single channel communication. Propose and draw the network topology among UAVs and to the military base. Suggest and justify types of signal and multiplexing suitable for this network.
(10 marks)

-END OF QUESTIONS –