



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2018/2019**

COURSE NAME : DIGITAL COMMUNICATION  
COURSE CODE : BEB 41803  
PROGRAMME CODE : BEJ  
EXAMINATION DATE : JUNE / JULY 2019  
DURATION : 3 HOURS  
INSTRUCTION : ANSWER **FOUR (4)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

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- Q1** (a) Briefly, explain these elements of Digital communication system:
- (i) Channel coding (3 marks)
  - (ii) Waveform coding (3 marks)
  - (iii) Structured Sequences (3 marks)
- (b) The most popular waveform codes are orthogonal code and biorthogonal code, for a 3-bit dataset construct its:
- (i) Orthogonal codeword set. (6 marks)
  - (ii) Biorthogonal codeword set. (6 marks)
- (c) The rule of the Hadamard matrix is used for example in CDMA by the matrix that generate Walsh Codes. Generate a matrix of 4 codes (sequence of numbers) orthogonal to each other. (7 marks)
- Q2** (a) A line code is the code used for data transmission of a digital signal over a transmission line. This process of coding is chosen so as to avoid overlap and distortion of signal such as inter-symbol interference. List **FIVE (5)** properties of line coding. (5 marks)
- (b) Suppose that codeword  $U = 1\ 0\ 1\ 1\ 1\ 0$  is transmitted and the vector  $r = 0\ 0\ 1\ 1\ 1\ 0$  is received; that is, the leftmost bit is received in error. Calculate the syndrome vector value  $S = rH^T$  and verify that it is equal to  $eH^T$ . (10 marks)
- (c) Let  $U = 1\ 1\ 0\ 1$ , for  $n = 4$ . Express the codeword in polynomial form, and solve for the third end-around shift of the codeword. (10 marks)

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**Q3** (a) Briefly explain Direct Sequence Spread Spectrum (DSSS) technique in digital communication system.

(6 marks)

(b) By aid of diagram, analyze the DSSS technique for input data  $A = 01001011$  using locally generated PN bit stream of

$PN = 01101001011010110101001101001001.$

(19 marks)

**Q4** (a) Digital modulation provides more information capacity, high data security, quicker system availability with great quality communication. There are many types of digital modulation techniques and also their combinations, depending upon the need. Discuss the following digital modulation techniques:

(i) Amplitude Shift Keying (ASK)

(3 marks)

(ii) Frequency Shift Keying (FSK)

(3 marks)

(iii) Phase Shift Keying (PSK)

(3 marks)

(b) **Figure Q4(b)** illustrates the digital input binary sequence of digital communication system. Calculate and illustrate the diagrammatic representation of ASK, BPSK and DPSK modulated output wave.

(9 marks)

(c) Discuss the Quadrature Phase Shift Keying (QPSK) demodulator with the aid of a diagram.

(10 marks)

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- Q5** (a) Inter-Symbol Interference (ISI) is an important distortion which is most likely to occur in digital communication. Explain this type of interference. (3 marks)
- (b) An effective way to study the effects of ISI is the Eye Pattern. Draw an example of eye diagram with appropriate label of its components. (12 marks)
- (c) Describe information that can be extracted about a particular system form an eye diagram. (10 marks)

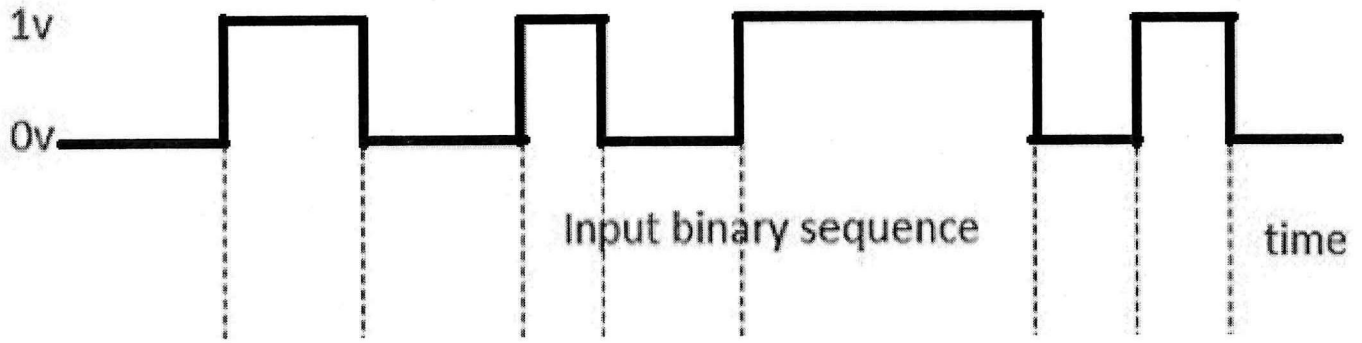
**-END OF QUESTIONS -**

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**Figure Q4(b)**

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