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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

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

COURSE NAME : MULTIMEDIA COMMUNICATION
COURSE CODE : BNF 32703
PROGRAMME CODE : BNF
EXAMINATION DATE : DECEMBER 2018 / JANUARY 2019
DURATION : 2 HOURS 30 MINUTES
INSTRUCTION : ANSWER ALL QUESTIONS

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

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Q1 (a) Explain briefly the differences between analog signals, digital signals and discrete signals. Draw suitable graphs to show the differences.

(6 marks)

(b) Given $x[n] = \{2, -3, 2, -4, 6, 1\}$. Determine and sketch:

- (i) $y[n] = x[n - 3]$
- (ii) $f[n] = x[n + 1]$
- (iii) $g[n] = x[-n]$
- (iv) $h[n] = x[-n + 4]$
- (v) $s[n] = x[-n - 3]$

(10 marks)

(c) Given $x[n] = \{2, 4, 6, 8\}$. Determine $y[n] = x[n - 0.5]$ using linear interpolation.

(4 marks)

Q2 (a) Write the following signals as a sum of impulses.

- (i) $x[n] = \{3, -5, 2, -6, 7\}$.
- (ii) $x[n] = \{1, -2, 3, 4, -6\}$.
- (iii) $x[n] = \{4, -1, 5, 1, 7\}$.
- (iv) $x[n] = \{-3, 7, -4, -2, 1\}$.
- (v) $x[n] = \{5, 2, -3, 7, 4\}$.

(5 marks)

(b) Describe the following signal as:

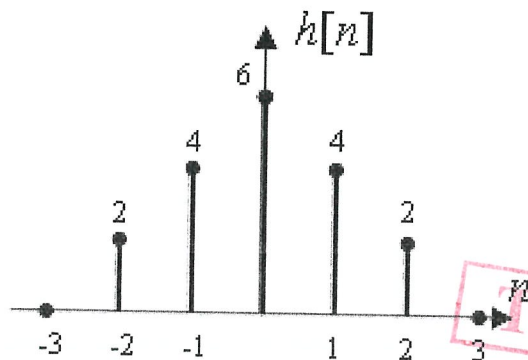


Figure Q2 (b)

(i) A numeric sequence

(2 marks)

(ii) A sum of impulses

(3 marks)

(iii) A sum of steps and ramps

(6 marks)

(c) Discuss the advantages of Digital Signal Processing (DSP) over Analog Signal Processing (ASP).

(4 marks)

Q3 (a) Explain briefly the convolution concept.

(2 marks)

(b) An FIR (finite impulse response) filter has an impulse response, $h[n] = \{1, -6, 3, 2\}$. Determine its response $y[n]$ to the input $x[n] = \{-2, 4, 1\}$. Assume that both $x[n]$ and $h[n]$ start at $n = 0$.

(3 marks)

(c) Let $h[n] = \{0, 2, -2, 5\}$ and $x[n] = \{1, -3, 7\}$ convolution starts at $n = 0$. Determine the output $y[n]$ using the following methods:

- (i) Sum by column
- (ii) Sliding strip
- (iii) Polynomial multiplication
- (iv) Zero insertion

(11 marks)

(d) Determine the periodic convolution of $x_p[n] = \{1, -4, 2, 6\}$ and $h_p[n] = \{3, 2, -6, 1\}$ with the period of $N = 4$.

(4 marks)

Q4 (a) Given the signal $x_1(t)$ be band-limited to 2 kHz and $x_2(t)$ be band-limited to 4 kHz. Determine the Nyquist rate for the following signals.

- (i) $x_1(3t)$
- (ii) $x_2(t - 5)$
- (iv) $x_1(t) + x_2(t)$
- (v) $x_1(t)x_2(t)$

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(5 marks)

(b) Given $x[n] = \{-1, 2, 3, 4\}$, $t_s = 1$. Determine the value of the reconstructed signal $x(t)$ at 3.5s that results from:

- (i) step interpolation.
- (ii) linear interpolation.

(4 marks)

- (c) Explain the differences between sampling with frequency sampling $f_s = 5\text{kHz}$ and sampling with frequency sampling $f_s = 70\text{Hz}$.
(4 marks)
- (d) The function of analog to digital converter (ADC) is to convert analog signal into digital signal. Draw details part of the analog to digital converter (ADC) and briefly explain each parts' function.
(7 marks)

- Q5** (a) Let consider the following discrete-time signal:

$$x[n] = \begin{cases} 0.7^n, & n \geq 0 \\ 0, & n < 0 \end{cases}$$

Quantize the signal using truncation techniques.

(6 marks)

- (b) A sampled signal that varies between -3 V and 3 V is quantized using B bits. Determine the value of B that will ensure an rms quantization error of less than 5 mV .
(4 marks)
- (c) Discuss the following multimedia security applications:.
- (i) Differences between visible watermarking and invisible watermarking.
(2 marks)
 - (iii) Internet security.
(2 marks)
- (d) A web provider wants to develop website for live streaming applications. Propose suitable compression for the application and explain advantages of the compression.
(6 marks)

- END OF QUESTIONS -

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