Department of Computer Systems Engineering,
University of Engineering and Technology, Peshawar,
Pakistan

Midterm Exam (Fall 2018) **Paper:** CSE-304 Computer Organization and Architecture
Time: 2 Hours **Marks:** 25

Note: Attempt all questions on answer sheet.

Question No. 1 (Marks=5) (CLO-3):

Given x=1101 and y=1101 in twos complement notation (i.e. x=-3, y=-3), compute the product $p=x \times y$ with Booth's algorithm.

Question No. 2 (Marks=5) (CLO-3)

Divide -5 by 3 (i.e. -5 is dividend and 3 is divisor) using signed division rules?

Question No. 3 (Marks=5) (CLO-1)

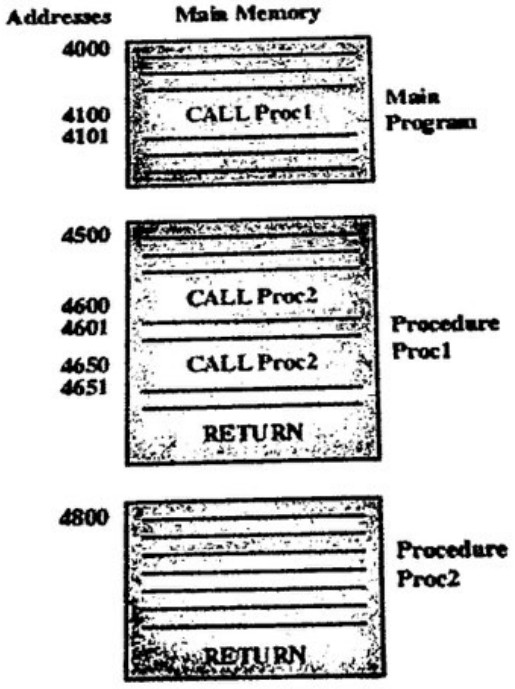
i. What are the steps in "Instruction Cycle"? What is the role of "Interrupt Cycle"? Explain it briefly with the help of flowchart.
ii. What is structure and how it is compared with functionality of the computer architecture?

Question No. 4 (Marks=5) (CLO-1)

i. What are synchronous and asynchronous systems? Explain it with the help of timing diagram.
ii. How can we extend the 8-bit signed number to 16-bit signed number? Give examples. What is the range of signed numbers, if number of bits of a word is 16 bit.

Question No. 5 (Marks=5) (CLO-1)

i. What is stack and stack pointer?
ii. What will be the contents of stack and stack pointer for the following scenario shown in the picture, assume stack pointer value is 5100H.



(a) Calls and returns

Department of Computer Systems Engineering,
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Final term Exam (Fall 2018) **Paper:** CSE-304 Computer Organization and Architecture
Time: 2 Hours **Marks:** 50

Note: Attempt all questions on answer sheet. Be precise and do your best!

Question No. 1 (Marks=10):

i. What are the parts of an instruction? Briefly explain it with examples.
ii. Implement the following equation using 0-Address format instructions (using mnemonics)? 16+20+24+28-32

Question No. 2 (Marks=10)

i. If the size of the program counter is 16 bits, what can be the maximum size of the memory in computer architecture provided the data width is 8 bits? 64K×8
ii. What flags represent in computer architecture? Explain at least four flags briefly with examples?

Question No. 3 (Marks=10)

i. How the carry bit act as an extension to the arithmetic and logic unit (ALU)? Explain briefly with examples?
ii. What is the difference between displacement, relative, base-register and index addressing schemes? Explain briefly with examples?

Question No. 4 (Marks=10) (CLO-1; C2-Comprehension; PLO1-Engineering Knowledge)

You have to design an instructions set architecture (ISA), whose characteristics are;

- 16 different operations (ADD, SUB, OUT, HLT etc.)
- 12-bit address (program counter (PC), a memory address register (MAR) etc.)
- 16-bit data registers (accumulators, B, Temp etc.)
- 16-bit instruction register (IR)

i. What will be the instruction size? 20
ii. Opcode size? 4
iii. Operand size? 16
iv. A number of locations in memory? 16K
v. Memory data size? 16

Question No. 5 (Marks=10) (CLO-2; C2-Comprehension; PLO1-Engineering Knowledge)

i. How scoreboard algorithm resolves the structural, data and control hazards? Explain it with the four cycles of the algorithm.
ii. What is the difference between;

- Read after write hazard
- Write after write hazard
- Write after read hazard

Explain it with examples?

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Department of Computer Systems Engineering
University of Engineering & Technology
Peshawar, Pakistan

Dated: January 11, 2019

Subject:	**Engineering Economics**
Exam:	**Final Term**
Weightage:	**50 %**
Time Allowed:	**2 Hrs (Part A: 30 minutes, Part B: 1 hour and 30 minutes)**

Part B [Marks 60]

Read the following instructions:

1. *Be clear and precise in your answers. **Do NOT** include unnecessary details.*
2. *You are expected to have brought **calculator** and **necessary stationary** only, anything else found in possession would be tantamount to cheating. **No sharing** of calculators is allowed during exam.*
3. *Consider **1dollar =130 Rupees** wherever required. Draw **cash flows** wherever required.*
4. *Pages are numbered from **5 of 8** to **8 of 8**. Make sure you have all of them*
5. *You can use the **interest table** attached for help in some questions; still you have to write the formula used for getting the factor value.*

Question 01 [Marks 10] **[CLO-3]**

Mrs. Akhtar is planning to place her savings earned by selling her jewelry in a bank account. She earns an amount of **Rs. 19,69,000** from the sale. She has to choose among four different offers provided by the saving institutions i.e. nominal interest rates of **6.35% compounded annually, 6.45% compounded quarterly, 6.55% compounded monthly, 6.325% compounded daily** and **6.255% compounded continuously.** She wishes to select the savings institution that will give her the highest return on this money. Which option should she select and why?

Question 02 [Marks 10] **[CLO-2]**

Pakistan International Airways has recently conducted a survey on its services and revenues. The surveys show that there was revenue of **Rs. 1,460,000** the first three years since **2001** and it reduced with constant rate of **Rs. 135,000** every year for next **12 years (i.e 2015)**. PIA wants to calculate what cumulative sum would be equivalent to these revenues in **2000** if the budget had an interest rate of **9%** compounded annually.

Question 03 [Marks 15] **[CLO-2]**

Microsoft lends **$10,000,000** for small projects in rural areas of India. The loan has to be refunded at **8%** interest rate compounded annually. Repayment should be made in such a way that an amount **A** must be paid for the first **8 years,** amount **3A** for next 5 **years** and amount **5A** for remaining years, keeping the interest rate **8%.** Total time period for which the loan is allotted is **20 years**. What sum of annuities still remains to be paid just after the **12th payment** is made? **(Hint: Take $10,000 equivalent to the present worth of all these annuities)**

[CLO-3]

Question 04 [Marks 10]

Mr. Cod is opening its restaurant near cantt area. It is expecting initial revenue of **$72,000** per year with an annual increase of about **$400** as per statistics. The initial investment required for the restaurant is **$170,000** and MARR per year is **8%**. The yearly expenses are expected to reach around **$35,000**. Find out if this income is large enough to cover the investment for a study period of **15 years**.

[CLO-3]

Question 05 [Marks 15]

Nike is constructing a mall near industrial estate. The initial investment includes land costs **$400,000**, working capital **$560,000,** building costs **$600,000** and other materials required costs **$250,000.** It is expected that the sales of the mall will reach up to **$750,000** per year for **12 years** at which time the land can be sold for **$500,000,** the building for **$350,000,** the materials for **$50,000** and all the working capital will be recovered **(Hint: Salvage values)**. The annual expenses for labor and other items will sum up to **$475,000** per year. If the company requires an **MARR** of **9%** on return, determine if it should invest in this mall? Use **AW** method to support your argument.

Good Luck

Department of Computer Systems Engineering

University of Engineering & Technology

Peshawar, PAKISTAN

Subject: Digital Signal Processing (5th Semester)

Exam: Final Term (Fall 2018)

Max Marks: 25

Attempt All Questions. **Time allowed : 2 hours**

Question 1:

a) The system function of a Linear Time-Invariant system is given bellow. (CLO 2) **(5)**

$$H[z] = \frac{3 - 4z^{-1}}{1 - 3.5z^{-1} + 1.5z^{-2}}$$

Find the ROC and impulse response h[n] of the system for the following cases.

i. When the system is stable
ii. When the system is causal
iii. When the system is anti-causal

b) Use one-sided z-transform to find y[n], n≥0, where; (CLO 2) **(3)**

$$y[n] = \frac{1}{2}y[n-1] + x[n]$$

$$x[n] = \left(\frac{1}{3}\right)^n u[n], \quad y[-1] = 1$$

Question 2:

a) The Fourier Transform of a signal x[n] is given by; (CLO 2) **(5)**

$$X(w) = \frac{1}{1 - \frac{1}{2}e^{-jw}}$$

Find the Fourier Transform of the following signals using properties of the Fourier Transform. Also explain how the spectrum of the signals in part (i) and (ii) are related to the spectrum of original signal x[n].

i. $x(n+1)$
ii. $e^{\frac{\pi}{4}n}x(-n)$
iii. $n[x(n) * x(n-1)]$

b) Determine and sketch the magnitude and phase response of the system shown in Figure 2. Also comment on the frequency response characteristics of the filter. (CLO 2) **(4)**

$H(\omega) = e^{-j\omega/2}\cos(\omega/2)$

$|H(\omega)| = |\cos(\omega/2)|$

$\angle H(\omega) = -\omega/2$

1/2

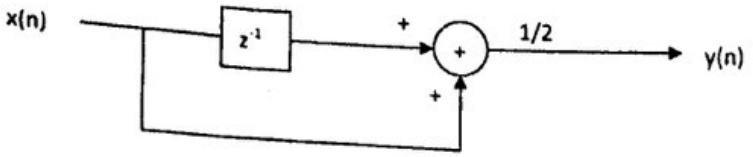

Figure 2

Question 3:

a) Determine the direct form I, direct form II and transpose structure for the following LTI system. Also compare these structures. (CLO 3) **(3+1)**

$$2y[n] + \frac{4}{3}y[n-1] - \frac{1}{2}y[n-2] = 2x[n] - \frac{3}{2}x[n-1] + \frac{5}{2}x[n-2]$$

b) Design a high pass FIR filter that meets the specifications given in Figure 3 bellow. (CLO 4) **(4)**
Note: Windows characteristics are given below.

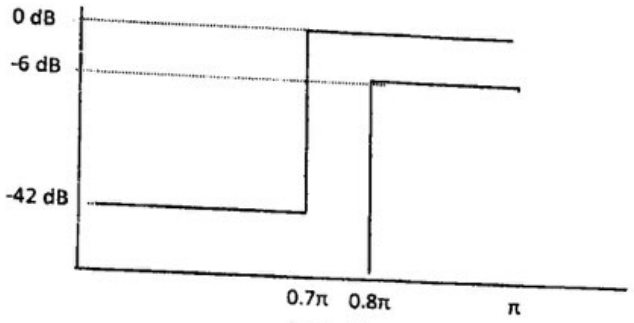

Figure 3

Window	Main-lobe width	Stop-band attenuation	Equation $0 \le n \le M-1$
Rectangular	$\frac{4\pi}{M}$	-21	1
Hanning	$\frac{8\pi}{M}$	-44	$0.5\left(1+\cos\frac{2\pi\left(n-\frac{M-1}{2}\right)}{M-1}\right)$
Hamming	$\frac{8\pi}{M}$	-53	$0.54+0.46\cos\frac{2\pi\left(n-\frac{M-1}{2}\right)}{M-1}$
Blackman	$\frac{12\pi}{M}$	-74	$0.42+0.5\cos\frac{2\pi\left(n-\frac{M}{2}\right)}{M-1}-0.08\cos\frac{4\pi\left(n-\frac{M}{2}\right)}{M-1}$

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Department of Computer Systems Engineering
University of Engineering & Technology, Peshawar

System Programming

Finalterm Exam, Fall 2018

Maximum Time Allowed: 2 Hours **Maximum Weightage: 50%**

- Be precise and concise in your answers. Attempt all questions on the answer sheet.
- Please indent and comment your code properly. Un-indented/commented code will not be checked
- All questions carry equal points

Q1. Please check the following statements and fix if you see issues. If no issue, say the statement is correct.

i) All signals can be ignored using the signal handler routines.
ii) Pipes performs interprocess communication through sockets.
iii) A virtual time (ITIMER_VIRTUAL) when it expires generate SIGALRM signal.
iv)TCB is stored in Operating System memory area and is shared by all threads.
v) Threads belonging to the same process share the stack memory, but not the heap memory.

Q2. Write method signatures for the following system calls. Method signatures include function name, list of parameters and return type.

e-g. int read (int fd, char * buf, int size);

i) times()
ii) gettimeofday()
iii) sigaction()
iv) mkfifo()
v) sysconf()
vi) pthread_attr_getstack()
vii) pthread_create()
viii) setitimer()
ix) kill()
x) pthread_join()

Q3. Write a system program that creates a child process whenever SIGUSR2 is received.

Q4. Write a set of system programs that implements the client-server communication model between two processes using fifos. The communication is terminated when character '$' is received by the server process. [PLO3/CLO3-Cognitive-Application]

Q5. Compare and contrast the use of multi-threading and multi-processing for matrix multiplication. Discuss from the point of view of memory overhead, cpu load and execution time. Justify your reasoning with example matrices. [PLO2/CLO2-Cognitive-Analysis]

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Subject: Digital Signal Processing (5th Semester)

Exam: Mid Term (Fall 2018)

Max Marks: 25

Attempt All Questions. **Time allowed : 2 hours**

Question1:

1) What are the steps involved in converting an analog signal into digital signal? Explain each step and how the error in these steps can be avoided or reduced? **(3 Marks)**

2) What is power and energy signals? Are finite duration signals power signals or energy signals? What about infinite duration signals? **(1+1 Marks)**

3) Given the discrete time signal x(n) shown in Figure 1, find and sketch the even and odd parts of the signal x(n-2). **(3 Marks)**

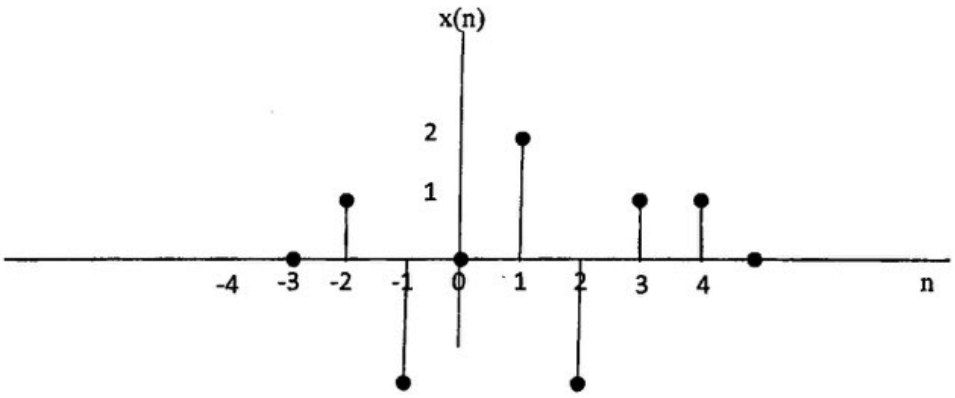

Figure 1

Question 2:

1) Find the convolution of x[n] and h[n] given bellow, **(2+2+1 Marks)**

   a) Analytically

   b) Graphically

$$h[n] = 2\delta(n+1) - \delta(n) + 2\delta(n-1)$$

n-2+1
n-1+1
n-3+1

-2-1
n-2-1
n-3-1

1/2

P.T.O

$$x[n] = \begin{cases} 1, & n = 0, 2 \\ 2, & n = 1, 3 \\ 0, & otherwise \end{cases}$$

Is the system given by h[n] a stable system? Is h[n] a causal or non-causal system?

2) Find the overall impulse response h[n] of the interconnection of systems shown in Figure 2, bellow.

(3+1 Mark)

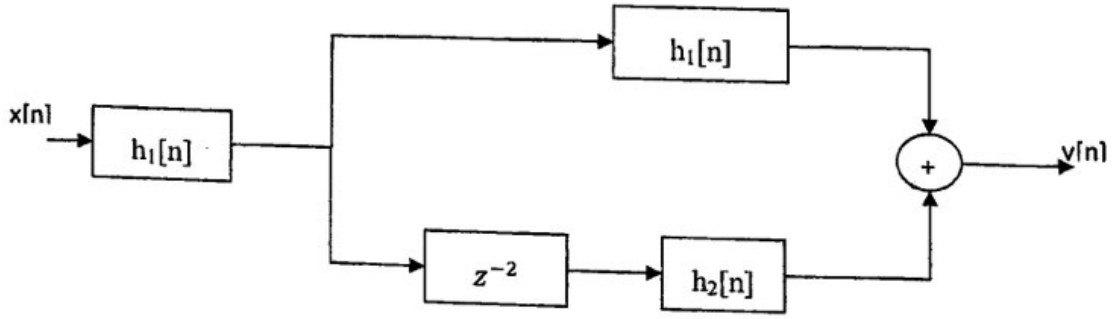

Figure 2

Where,

$$h_1[n] = 1\delta(n) - 2\delta(n-1) + 1\delta(n-2)$$

$$h_2[n] = 2\delta(n+1) - \delta(n) + 2\delta(n-1)$$

Are systems $h_1[n]$ and $h_2[n]$ causal systems? What about the equivalent system $h[n]$?

Question 3:

1) Draw the Direct Form 1 and Direct Form 2 structure for the LTI System described by the following difference equation.

(2 Mark)

$$2y[n] - 5y[n-1] - 4y[n-2] = 3x[n] + 2x[n-1]$$

2) Find the homogeneous solution of the system given by the following difference equation with given initial condition.

(2 Mark)

$$y[n] - 3y[n-1] - 4y[n-2] = x[n] + 2x[n-1]$$

$$y[0] = 1, \qquad y[1] = 5$$

3) Find the z-transform of the following signals using the properties of z-transform. State clearly the property used in each step.

(4 Marks)

$$x_1[n] = \left(\frac{1}{2}\right)^n [u(n) - u(n-5)]$$

$$x_2[n] = n\left(\frac{1}{3}\right)^{n-1} [u(n-1) - u(n-5)]$$

2/2