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

Subject: Digital Signal Processing (5th Semester)
Exam: Final Term (Fall 2019)
Max Marks: 25

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

(CLO 2)

Question 1:

a) Two LTI systems $h_1[n]$ and $h_2[n]$ are connected in series, where $h_1[n]$ is causal system while $h_2[n]$ is non-causal. What can be said about their equivalent system h[n]. **(2)**

i) h[n] will be causal or non-causal?

ii) What about causality of equivalent system h[n] if $h_1[n]$ and $h_2[n]$ are connected in parallel?

b) Determine the output y[n], n≥0, using one-sided z-transform, where; **(3)**

$$y[n] = \frac{1}{4}y[n-2] + x[n]$$
$$x[n] = u[n]$$
$$y[-1] = 0\ ,\ y[-2] = 1$$

c) Determine and sketch the magnitude and phase response of the FIR system described by the following difference equation. Also discuss the frequency domain filtering characteristics of the system. Find the response y[n] when signal x[n] given bellow is passed through this system. **(3+2)**

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

$$x[n] = 3 + 2\cos\left(\frac{\pi}{6}n\right) + \frac{1}{2}\cos\left(\frac{\pi}{3}n\right)$$

(CLO 3)

Question 2:

a) Draw the direct form structure for the following FIR system. **(2)**

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

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

y[-n].

$$\frac{z^3 - z^{12}}{z^3 - z^2 - z^1}$$

$$\frac{z(z^3+z}{z(z-1}$$

$$z(z^2 - z - 1$$

P.T.O

b) What are the advantages and disadvantages of (a) **series** (b) **parallel** form structures for the implementation of the LTI systems? Why second order sub-systems are used in series/parallel form structures instead of first order sub-systems? **(2+1)**

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

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

(CLO 4)

Question 3:

a) Why the ideal filters are not practically realizable? How the spectral response of real filters differs from that of an ideal filters. **(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.

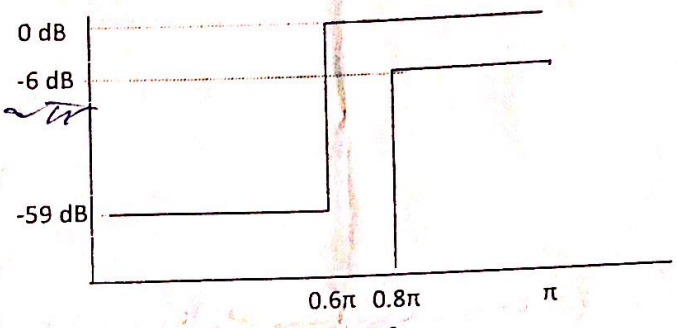


Figure 3

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	$0.42-0.5\cos\frac{2\pi\left(n-\frac{M-1}{2}\right)}{M-1}-0.08\cos\frac{4\pi\left(n-\frac{M-1}{2}\right)}{M-1}$

UNIVERSITY OF ENGINEERING AND TECHNOLOGY PESHAWAR
Department of Computer Systems Engineering
Final Term Exam (Fall 2019)

Instructor: Dr. Zahid Wadud Mufti
Subject: Communication Systems

Time Allowed: 2 Hr
Semester: 5th

Instructions:

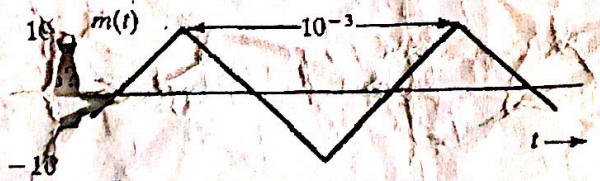
- Attempt ALL questions in sequence; Paper consists of FIVE questions.
- Write your name on all resources before starting paper.
- Exchange of calculator is not allowed.
- Read the complete paper in the first 15 minutes and get you queries (if any) clarified within this time; no question will be entertained after this time, and if you feel any data is missing, you can assume any reasonable values for it.

Question # 1 (Marks 20)

1. Discuss the quoted text in detail "The advantage of envelop detection in AM has its price in term of excessive power wasted in transmitting the carrier itself".

Question # 2 (Marks 20) (CLO-2, Cognitive-2)

1. Draw block diagram for generating the Quadrature Amplitude Modulation (QAM) and explain the functionality of its each block.
2. Sketch the AM signal $[A + m(t)]cos\omega_c t$ for the periodic triangle signal $m(t)$ shown in figure below corresponding to the modulation index: (a) $\mu = 0.5$; (b) $\mu = 2$. How do you interpret the case $\mu = \infty$?



Question # 3 (CLO-3, Cognitive Level 4) (Marks 20)

Mobile operator design a cellular structure in suburban area of 10,000 km^2. Find the total number of base stations needed for a mobile sensitivity level of -100 dBm if P_0 is considered to be 0 dBm. Assume the close-in reference distance d_0 is 10m, path loss exponent n = 3.5.

Question # 4 (Marks 20)

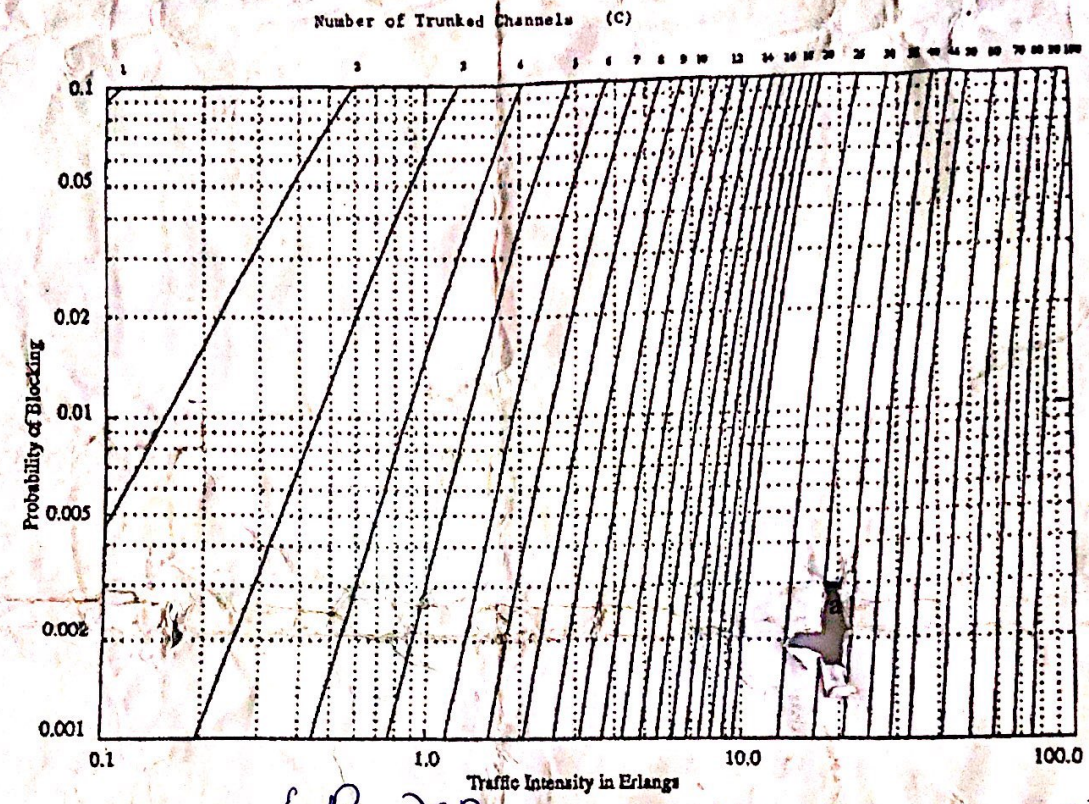
An urban area has a population of two million residents. Three competing trunked mobile networks (systems A, B and C) provide cellular service in this area. System A has 394 cells with 19 channels each, system B has 98 cells with 57 channels each and system C has 49 cells, each with 100 channels. Find the number of users that can be supported at 2% blocking if each user averages two calls per hour at an average call duration of three minutes. Assuming that all three trunked systems are operated at maximum capacity, compute the percentage market penetration of each cellular provider.

$$A = 3\frac{\sqrt{3}}{2} \times R^2$$

$$N = \frac{D}{R}$$

Question # 5 (Marks 20)((CLO 4, Cognitive Level 3)

1. Suggest two ortho-normal CDMA chip codes and also express their properties.
2. Analyze how multiple users in CDMA system suffer with Multiple Access Interference (MAI). Support your explanation through signal to noise ratio SNR_o with appropriate figures and mathematical prove.



$$P_r = P_0 \left(\frac{R}{D_0}\right)^{-n}$$

$$[1 \;\; 0 \;\; 1 \;\; 1] \begin{bmatrix} 1 \\ 0 \\ 1 \\ 1 \end{bmatrix}$$

$1 + 0 + 1 + 1$

$R = ?$

GOS = 0.02

$A_u = 0.1$

$A = ?$

$$A = \frac{3\sqrt{3}}{2} \times R^2$$

$A = UA_u$

$U = \frac{A}{A_u}$

$$N = \frac{R}{R}$$

1) $A_u = \lambda \times H$

2) $A = 12$

3) $U = \frac{12}{A_u}$

4) U x Cells

Name: _____ Registration# _____

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

Dated: January 31, 2020

Subject:	**Engineering Economics**
Exam:	**Final Term**
Weightage:	**60 %**
Time Allowed:	**2 Hrs**

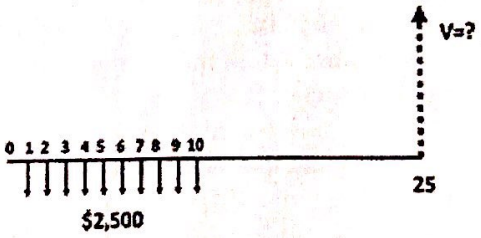
Read the following instructions:

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 =155 Rupees** wherever required. Draw **cash flows** wherever required.*
4. *Pages are numbered **from 1 of 4 to 4 of 4**. Make sure you have all of them*
5. *You can use the **interest table** attached for help in some questions; Yet you must write the **formula and expressions** for the interest factor used and also do the calculations.*

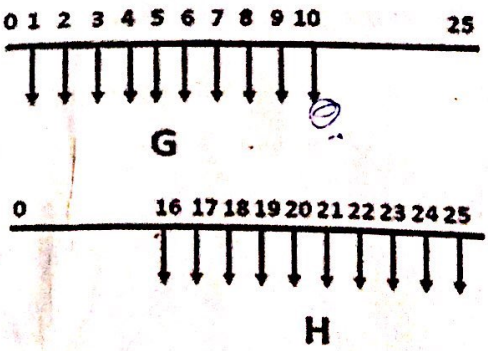
Question 01: Short Questions. **[Marks 20]**

1. Evaluate the **range of profitable demand** for a new project by **EWALL Pvt. Ltd.** The variable cost (c_v) per unit item of particular electronic component is **$750**, the intercept on price **(a)** is **2500** and negative slope **(b)** is **50** and the fixed costs (C_F) sums up to **$7,300** per month.

2. For what value of **V** will the following cash flow be equivalent for interest rate equal to **9%**? **[CLO-3]**



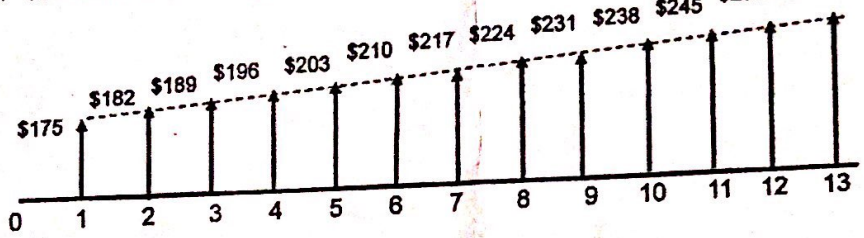
3. Find **G** in terms of **H** if the following cash flows are equivalent at **8%** interest rate. **[CLO-2]**



Name: _____ Registration# _____

4. What is the Effective Interest Rate (EIR) for a scenario where **$23,000** has to be repaid after **5 years** with a nominal interest rate (APR) of **13.5%** compounded continuously?

5. Given the interest rate of **8%**, evaluate the correct expression for given cash flow at N=0. Draw cash flow(s) for your solution. **[CLO-3]**



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

Mr. Kamran had some savings that he placed in a bank account ten years ago. He earned an amount of **$2, 968,000** from an initial investment. The investment plan he chose was such that it earned an interest of **6.5%** for the first three years, **4.5%** for the next two years, **7.4%** for the next four years and **8%** for last/tenth year. He also made a withdrawal of **Rs. 85,25,000** at year **5**. Draw the cash flow for this scenario and evaluate the initial investment that Mr. Kamran had made.

Question 03 [Marks 20] **[CLO-3]**

Bahria Orchard is establishing a **sugar mill** with the resources from its estate business. The initial investment required for the sugar mill is land costs of **$150,000**, raw material of **$250,000**, working capital of **$760,000**, construction costs of **$650,000** and estimated hidden costs of **$300,000**. It is expected that the revenue from the mill will reach up to **$1,050,000** per year. The annual expenses for labor, electricity, fuel and other items will sum up to **$375,000** per year. The raw materials worth **$150,000** and the hidden costs worth **$250,000** remains unused by the end of **15 years (Hint: Salvage values)**. If the company requires an **MARR** of **9%** on return, determine if it should invest in this mill? Use **AW** method to support your argument. Verify your argument using **PW** or **FW** method.

Question 04 [Marks 10]

The **Government Treasury Bond** that matures in **10** years has a face/Par value of **$20,000** and earns at the rate of **5%**. If the yield rate applied is **8%** compounded quarterly; How much is the worth of this bond at present time in order to buy this bond?

Good Luck

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

Final term Exam (Fall 2019) **Paper:** CSE-304 Computer Organization and Architecture
Time: 2 Hours **Marks: 60**

Note: Attempt all questions on answer sheet.

Question No. 1 (Marks=10):

i. What are the parts of an instruction? Briefly explain it with examples.

ii. What is stack? How it works for the following program;

PUSH A
PUSH B
PUSH C
POP D

Status of registers:

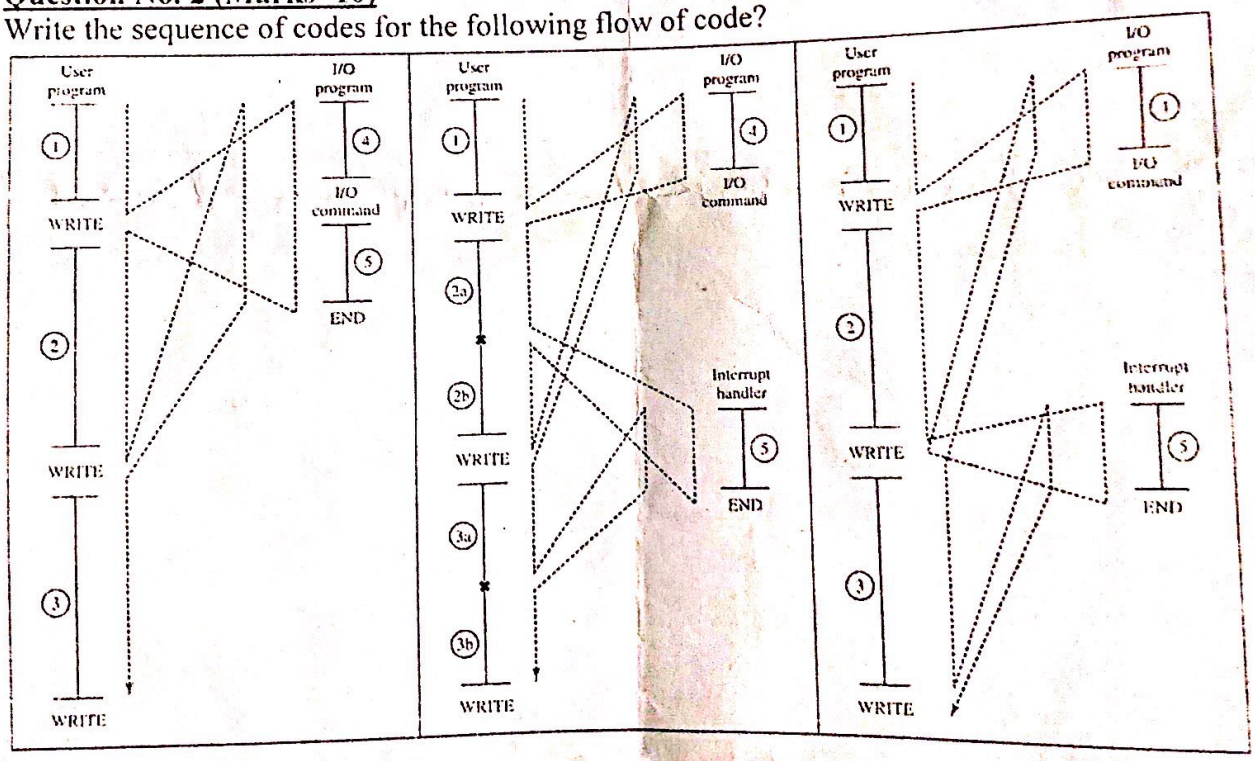
SP=2100H; A=1234H; B=5678H; C=9A25H

Where;

SP(stack pointer), A, B, C, D are 16 bit-registers while each memory location is of 8-bit size.

Question No. 2 (Marks=10)

Write the sequence of codes for the following flow of code?



Question No. 3 (Marks=10)

i. Write the assembly code for the expression: F=(X+Y)*Z–W using: 0-address, 1-address, 2-address, and 3-address instruction format. Compare them using a number of instructions required in each addressing format. Which instruction format will be easier for the compiler to process?

ii. Store the 32-bit word $(A1B3C5D7)_{16}$ in the memory having each location of 8-bit size using big endian and little endian format. Consider the memory addresses as 0h, 1h, 2h. 3h, ...

Question No. 4 (Marks=15) (CLO-2)

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?
ii. Opcode size?
iii. Operand size?
iv. A number of locations in memory?
v. Memory data size?

Question No. 5 (Marks=15) (CLO-3)

Explain the following:

a) How the scoreboard algorithm (Dynamic Scheduling Algorithm) solves the structural hazard?
b) Explain the concept of data forwarding using 5 stages of MIPS architecture?
c) How the backward forwarding problems can be resolved?
d) What are the five different ways to solve the control hazards problem?
e) What is the difference between direct and indirect addressing schemes?