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

Finalterm Exam (Fall 2022) Paper: CSE-304 Computer Organization and Architecture

Time: 2 Hours Marks: 50

Note: Attempt all questions briefly and precisely on the answer sheet.

Question No. 1 (Marks=5+5)

i. How does the carry bit extend to the Arithmetic and Logic Unit (ALU)? Give an example.

ii. How can the carry bit be used to make any loop's programming decisions? Give an example.

Question No. 2 (Marks=2+2+2+2+2)

What are the features of 64K x 16 bits RAM vs 256 x 32 bits RAM in terms of;

a. Address bus width 16 / 8
b. Data bus width
c. Registers size
d. Program counter register size
e. The number of memory locations.

Question No. 3 (Marks=5+5)

i. What are the parts of an instruction? Give an example.

ii. What are the extended register instructions? Give an example.

Question No. 4 (Marks=5+5)

i. What is the difference between ADD B and ADC B instructions? Give an example.

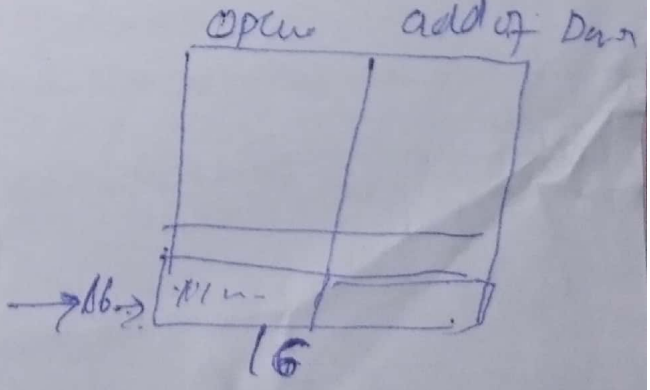
ii. What is the sign bit connected with ALU? How does it work? Give an example.

Question No. 5 (Marks=5+5)

i. What are register-register instructions as compared to immediate instructions in any computer architecture? Give an example.

ii. What is the difference between macro instructions and micro instructions? Give an example.

ADC : ADD Compliant
OR
ADD carry



Department of Computer Systems Engineering,
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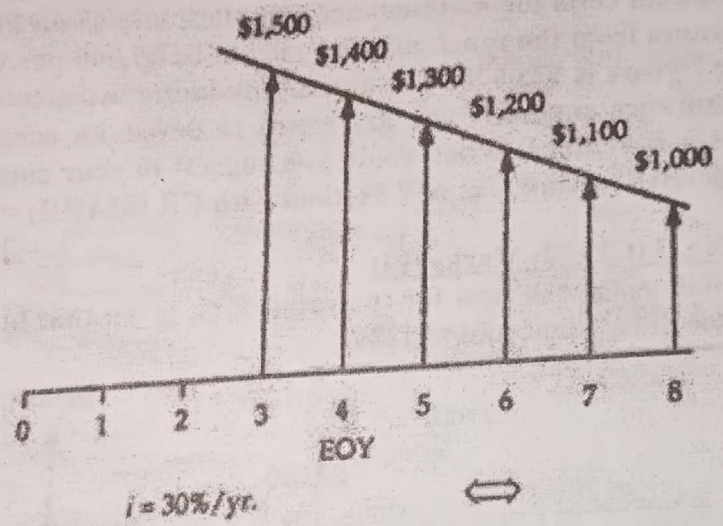
Pakistan

Exam: Final term (Fall 2022) **Time:** 2 Hours
Paper: CSE-305 (5th Semester) **Marks:** 50

Note: Attempt all questions on the answer sheet.

Question No. 1 (CLO 2-3, Marks 20):
Attribute suitable engineering economic terminology to the following scenarios.

a. **Devise a single-line notational expression for the following gradient series at N=8. (3 Points)**



$F = A\left(\frac{(1+i)^N - 1}{i}\right)$

b. **Devise the sinking fund notation for 10% interest and 8-time stamps. (1 Point)**

c. **Devise the single cash flow that represents the following notational expression for the present worth: $2000 (P/A, 5%, 20) + $175 (P/F, 5%, 1) + $200 (P/G, 5%, 20). (3 Points)**

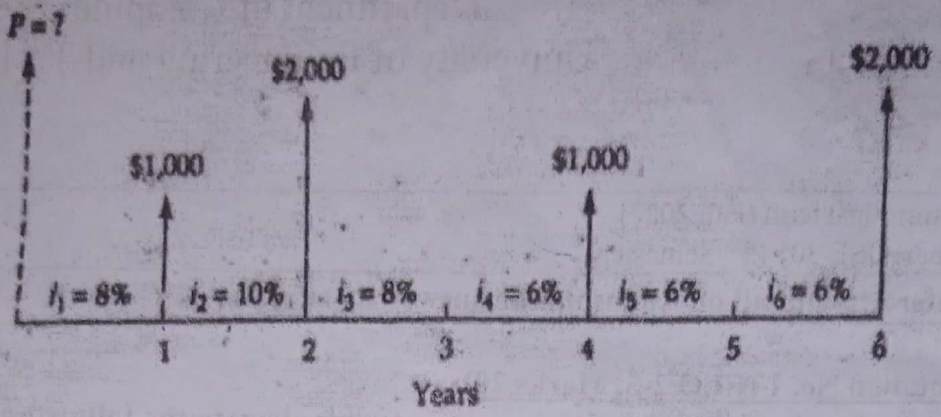
d. **Evaluate the rate of interest that can reduce a single payment at the EOY-10 to 5 times at present. (4 Points)**

e. **Provided nominal interest rate APR of 10% compounded monthly and the uniform payment made quarterly, devise the expression for the effective interest rate EIR for this venture. (2 Points)**

f. **Calculate the number of time stamps required to increase an initial investment to fifteen times its initial value at the rate of 12.5%. (3 points)**

g. **Devise a single-line notational expression for the following multiple single payment cash flow at P: (3 Points)**

h. **Name the formal economic terminology for (P/F, i%, N). (1 Point)**

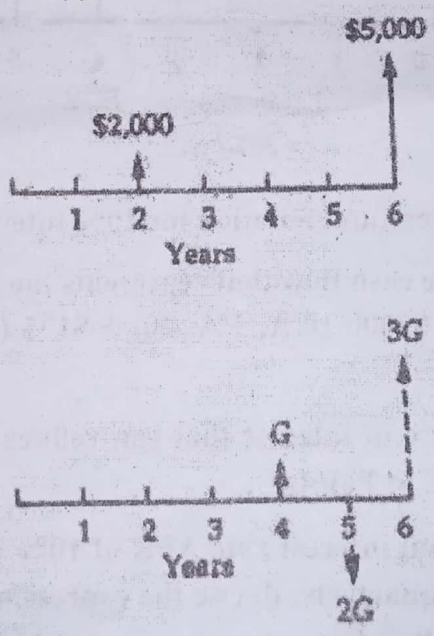


Question No. 2 (CLO 3, Marks=10)

The running businesses of Wilbur trout ranch are for sale and your company wants to purchase it for a more wanted investment after 7 years. The initial costs for the business are $50,000. Annual costs for maintenance, supplies, and so on are estimated to be $3,000 per year. Revenues from the ranch are expected to be $7,000 per year. The salvage value of the land after 7 years is $25,000. The annual minimum attractive rate of return is 12%. As a quality assurance engineer, you are asked to devise an economic feasibility plan for the company's new venture. What would you suggest to your company based on the feasibility plan you devised? [Hint: Use AW Method with CR (MARR) = (I-S) (A/F, i%, N) - I (i%)]

Question No. 3 (CLO 2, Marks=10)

Solve the following cash flow for the value of G, given that both cash flows are equivalent. Let the interest rate be equal to 12%.



Question No. 4 (CLO 3, Marks=10)

The retirement plan for a venture is made for the $100 (A) saved at the end of each month (K) that earns at the rate of 4.5% (r) interest compounded continuously (∞) per year. Determine the accumulated amount saved with this plan at the end of 30 years. If this plan is not selected and the same savings are made to another venture that earns at 5% (r) interest compounded monthly (M), will this accumulated amount at the end of 30 years overcome the amount gained with the previous plan? [Hint: Determine which plan is better by finding the future worth]

Department of Computer Systems Engineering,
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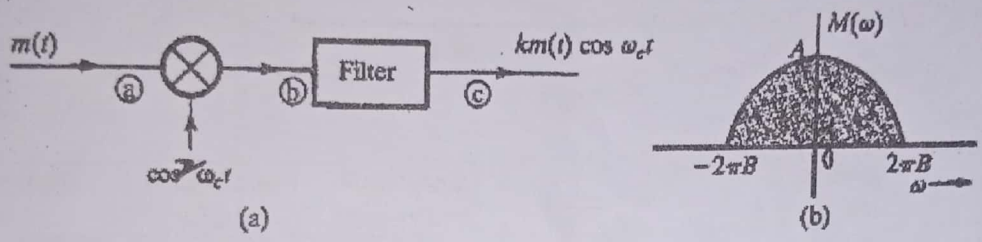
Exam: Final term (Fall 2023) **Time:** 2 Hours
Paper: CSE-309, Communication Systems (5th Semester) **Marks:** 50
Note: Attempt all questions on answer sheet.

Question No. 1 (Marks 10)(CLO-3, PLO-3)

You are asked to design a ***DSB-SC*** modulator to generate a modulated signal $km(t)cos\omega_c t$, where $m(t)$ is a signal band-limited to B Hz. Figure below shows a ***DSB-SC*** modulator available in the stock room. The carrier generator available generates not $cos\omega_c t$, but $cos^2\omega_c t$. Explain whether you would be able to generate the desired signal using only this equipment. You may use any kind of filter you like.

a. What kind of filter is required in figure below?
b. Determine the signal spectra at points b and c, and indicate the frequency bands occupied by these spectra.
c. What is the minimum usable value of ω_c?

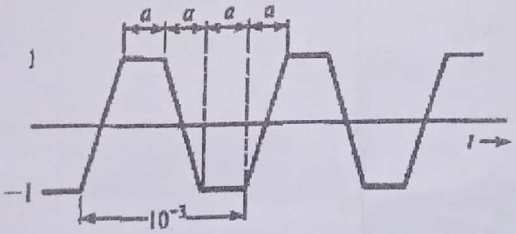


Question No. 2 (Marks 10)

What are the *BW* efficient variants of the *AM* signals? Describe *SSB* in detail and the role of Hilbert transformation to overcome *BW* inefficiency.

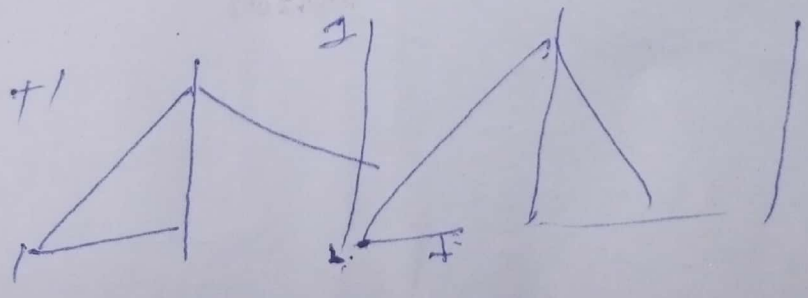
Question No. 3 (Marks 10)

Sketch $\varphi_{FM}(t)$ and $\varphi_{PM}(t)$ for the modulating signal $m(t)$ shown in figure below, given $\omega_c = 10^8$, $k_f = 10^5$, and $k_p = 25$



Question No. 4 (Marks 10)

a) "As long as the sampling frequency f_s is greater than twice the signal bandwidth B (in hertz), $\overline{G(\omega)}$ will consist of no overlapping repetitions of $G(\omega)$". Describe in detail the quoted text with proper reasoning and mathematical proof. Also show the relevant figures.



b) The treachery of Aliasing is the fundamental difficulty in reconstructing a signal from its samples. Describe the cause and solution of the Aliasing effect.

Question No. 5 (Marks 10)

A signal $m(t)$ band-limited to $3kHz$ is sampled at a rate 33.33% higher than the Nyquist rate. The maximum acceptable error in the sample amplitude (the maximum quantization error) is 0.5% of the peak amplitude m_p. The quantized samples are binary coded. Find the minimum bandwidth of a channel required to transmit the encoded binary signal. If 24 such signals are time-division-multiplexed, determine the minimum transmission bandwidth required to transmit the multiplexed signals.

0.078 MB

1.537 MB

$\cos^2 \omega_1 t + \cos 2\omega_c$

$\frac{}{2}$

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

Subject: Digital Signal Processing

Exam: Final Term (Fall 2022)

Total Marks: 25 **Time allowed: 2 hours**

Question 1: **(CLO2)**

1) The set of the Fourier Series coefficients a_k of a discrete-time signal $x[n]$ is given bellow, draw the magnitude and phase spectrum of $x[n]$. What will the period N and fundamental frequency ω_0 of the signal $x[n]$? Express the signal $x[n]$ in the form $x[n] = \sum_{k=<N>} a_k e^{jk\omega_0 n}$ and sketch $x[n]$. **(2+1+2 Mark)**

$$a_0 = 1, \quad a_1 = \frac{1}{2} - \frac{1}{2}j, \quad a_2 = 0, \quad a_3 = \frac{1}{2} + \frac{1}{2}j$$

2) Given the Fourier series coefficients a_k for the signal $x[n]$ in part(a) above; find the Fourier series coefficients b_k and c_k for the signal $x_1[n]$ & $x_2[n]$ given below; **(2+2 Marks)**

$$x_1[n] = 2x[n-1]$$
$$x_2[n] = x[n-1] + x[1-n]$$

Note: Mention the property of Fourier series used at every step

Question 2:

1) Use Fourier Transform method to find the output $y[n]$ of the LTI system given by the following difference equation when the input signal $x[n]$ is passed through it. **(4 Marks)**

$$y[n] = x[n] + \frac{3}{4}y[n-1] - \frac{1}{2}y[n-2]$$
$$x[n] = \frac{1}{2} + 2\cos\left(\frac{\pi}{4}n - \frac{\pi}{6}\right) + \frac{1}{3}\cos\left(\frac{\pi}{2}n\right)$$

Question 3: **(CLO3)**

2) Determine the direct form I, direct form II and transpose structures for the LTI system given below. Also compare the good and bad aspects of these structures. **(4 Marks)**

$$y[n] + 0.2y[n-1] - 0.5y[n-2] = 3x[n] + 1.5x[n-1] + 3.6x[n-2]$$

$\frac{1}{1} \div \frac{3}{4} e^{-j\omega}$

Question 4:

1) Draw the spectrum of an Ideal low pass filter. Why this ideal filter cannot be implemented practically? How the real filters differ from the ideal filters and how the spectrum of such real filter deviates from the ideal behavior. **(CLO 4)** **(3 Marks)**

2) Design a low pass FIR filter to meets the specifications given in Figure-1 bellow. Justify your choice of window and filter length M. **(4+1 Marks)**
Note: The characteristics of different windows are given below.

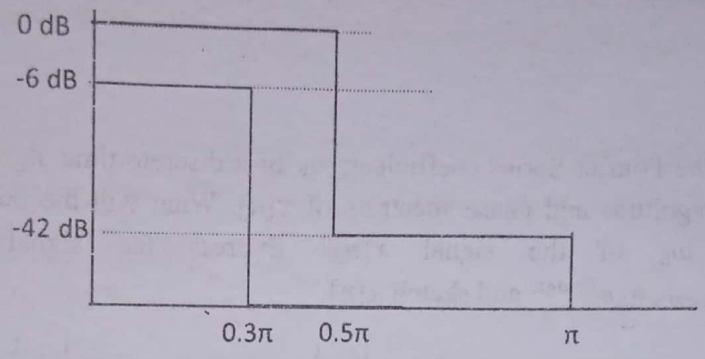


Figure-1

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

$$H(z) = \frac{1}{1-\frac{3}{4}z^{-1}-\frac{1}{2}z^{-2}}$$

Department of Computer Systems Engineering,
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Pakistan

Midterm Exam (Fall 2022) Paper: CSE-304 Computer Organization and Architecture
Time: 2 Hours Marks: 30

Note: Attempt all questions briefly and precisely on the answer sheet.

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

i. What are interrupts? What is the difference between disable interrupts and define priorities interrupts?

ii. How can we extend the 16-bit signed number to a 32-bit signed number? Give examples. What is the range of signed numbers if the number of bits of a word is 32 bits?

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

i. What is the purpose of a Program Counter (PC)? How does it work?

ii. What are the steps in the "Instruction Cycle"? What is the role of the "Interrupt Cycle"? Explain it briefly with the help of a flowchart.

Question No. 3 (Marks=5)

i. What is the difference between dedicated and multiplexed bus types?

ii. Consider a hypothetical microprocessor generating a 32-bit address and having a 32-bit data bus. What is the maximum memory address space that the processor can access directly if it is connected to "16-bit memory"?

Question No. 4 (Marks=5)

i. What is structure, and how is it compared with the functionality of the computer architecture?

ii. What is the purpose of the Instruction Register (IR) and Control Unit (CU)?

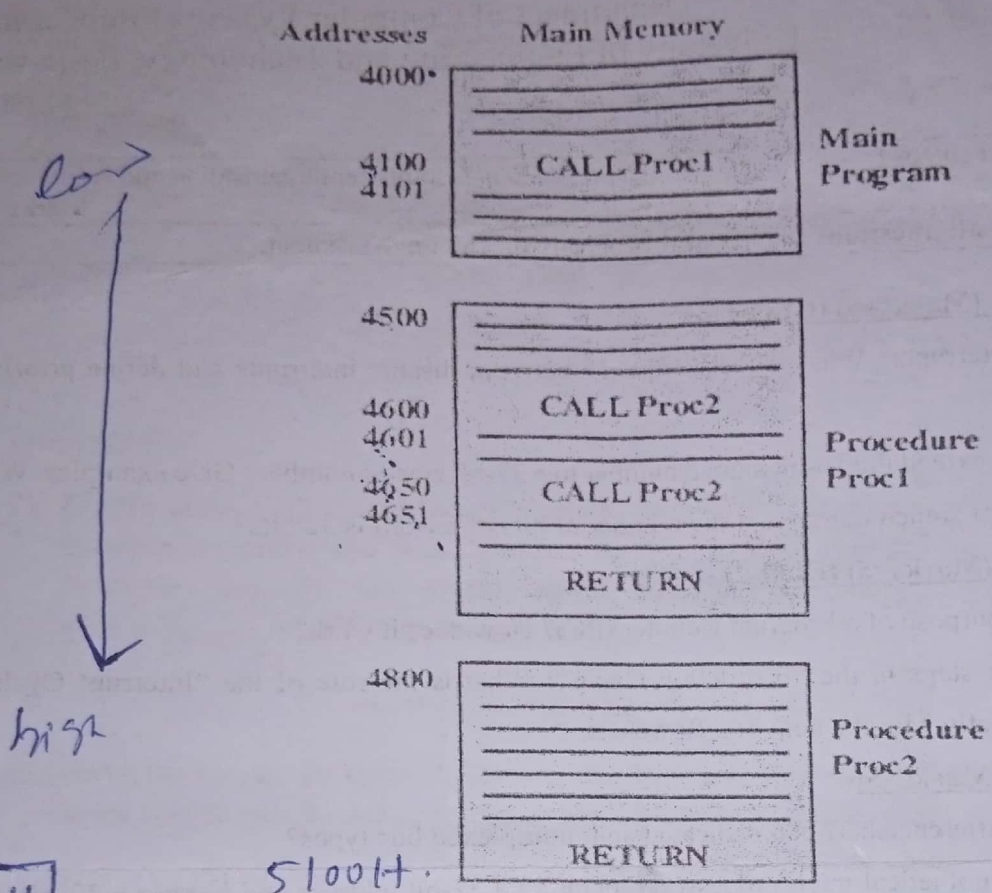
Question No. 5 (Marks=5)

i. What are synchronous and asynchronous systems? Explain it with the help of a diagram.

ii. What architectural features will allow this microprocessor to access separate "I/O devices"?

Question No. 6 (Marks=5)

What will be the contents of the stack and stack pointer for the following scenario shown in the Figure 1? Assume the stack pointer value is 5100H.



(a) Calls and returns

Figure 1

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

Subject: Digital Signal Processing (5th Semester)

Exam: Mid Term (Fall 2022)

Max Marks: 20

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

Question 1:

1) What is quantization, and, quantization error? How is quantization error $e_q(t)$ related with the step size Δ in case of rounding and truncation? How is quantization step size Δ related to number of quantization levels 'L' and number of bits 'b'? **(3 Marks)**

2) Let a discrete-time signal $x[n] = 2.1sine\left(\frac{\pi}{5}n + \frac{\pi}{5}\right) + 1$ is quantized with step sizes (a) $\Delta = 0.05$, and (b) $\Delta = 0.01$. How many bits are required in A/D converter in each case? Among the two cases which quantization is more accurate? **(3 Marks)**

Question 2: **(CLO_1)**

1) For the x(n) shown in Figure 1, find and sketch **(2 Marks)**
   a. $-x(2n-2)$
   b. $\frac{1}{2}x(-\frac{1}{2}n+4)$

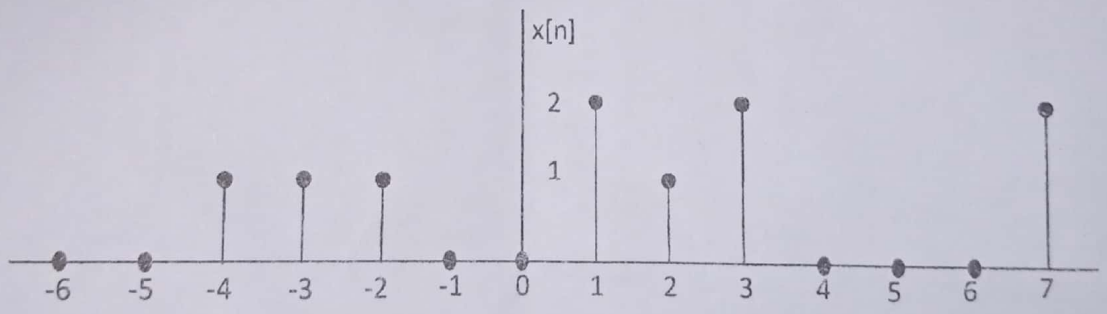


Figure 1

2) Find and sketch the even part $x_e[n]$, and odd part $x_o[n]$, of the signal x(n) shown above in Figure 1 above. **(2 Marks)**

Question 3: (CLO_2)

1) Signal x[n] is passed through the system with impulse response h[n] given below. Determine the response y[n], **(4+1 Marks)**

$$x[n] = \begin{cases} (\frac{1}{2})^n, & -1 \le n \le 3 \\ 0, & otherwise \end{cases}$$

and

$$h[n] = \begin{cases} n^2, & -1 \le n \le 1 \\ 0, & otherwise \end{cases}$$

Is the system given by h[n] an FIR or IIR, and why?

Is h[n] a stable system or unstable system, and why?

2) Find the natural response of the following LTI system with given initial condition. **(2 Mark)**

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

$$y[0] = 2$$

$y_n[n] = 2(\frac{1}{3})^n$

3) Find the z-transform of the following signals using the **definition** of z-transform and find their region of convergence? **(3 Marks)**

a) x[n] given in Figure-1.

b) $x[n] = (\frac{1}{3})^n u[n-2]$

Name: _____ Registration # _____

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

Subject: **Engineering Economics**	Exam: **Mid Term Fall 22**
Marks: 20	Time Allowed: **2 Hours**

DIRECTIONS:

1. *Be clear and precise in your answers. Avoid unnecessary details.*
2. *You are expected to have brought a calculator and necessary stationery, anything else found in possession would be tantamount to cheating. No sharing of calculators is allowed.*
3. *Pages are numbers from 1- 2. Make sure you have both of them.*

Question 01 [Marks 5] **[CLO-1]**

Fill with the proper Economic Environment Terminologies:

i- The type of costs that are not paid with cash but occur in documents only are _____

ii- The Life-Cycle costs are least in _____ phase.

iii- The demand for _____ is highly elastic.

iv- Elasticity is the % ratio of _____

v- The two types of Economics are _____

vi- For developing rational alternatives, we must use a consistent _____

vii- The four key factors in selecting good engineering economic decisions are:

_____

viii- The type of cost that is made due to some past decision is _____

ix- The initial breakeven point can be attained earlier by increasing the _____

x- The indirect costs are also known as _____

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

Mond-Licht Studios estimates that it increases its item's sales volume by decreasing the selling price. The revenue function is given by $aD\text{-}bD^2$ where D represents the units of demand of items per month. The fixed costs are estimated to be $1,145 per month and the total costs for 70% of demands are $1,647.5. Net sales at 70% utilization are $2,556. The demand relationship with the price is given by $D = 231.0965 - 1.025p$, and the price per unit item is $50.

i- Determine the volume for maximum profit.

ii- Maximum profit for this venture.

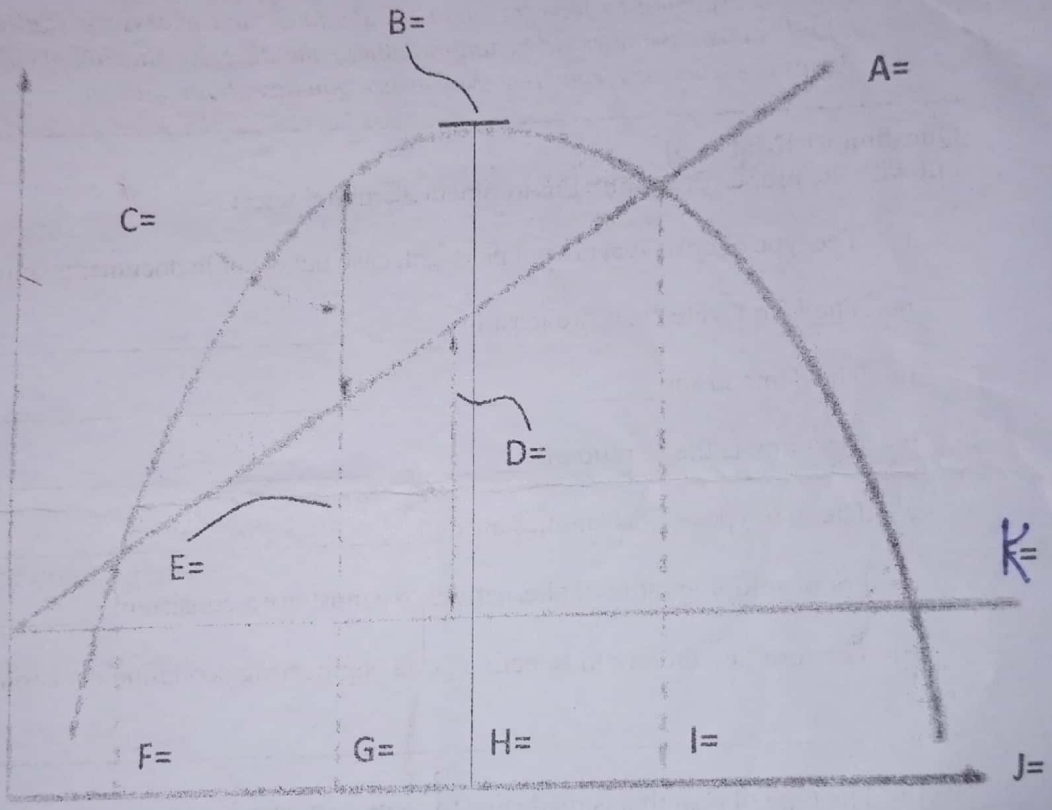
Name: _____ Registration #_____

iii- Range of profitable demand.

iv- Maximum total revenue.

Question 03 [Marks 05] **[CLO-1]**

Mark/Name the Economic Environment Terminologies and formulas for unknowns (A, B,….., J, X-axis and Y-axis) in the following Total Revenue Function.



Y-Axis=

X-Axis=

Good Luck