

Department of Computer Science & Engineering
University of Asia Pacific (UAP)

Program: B.Sc. in Computer Science and Engineering

Final Examination

Spring 2021

4th Year, 1st Semester

Course Code: CSE 401

**Course Title: Mathematics for Computer
Science**

Credits: 3.0

Full Marks: 120* (Written)

Duration: 2 Hours

* Total Marks of Final Examination: 150 (Written: 120 + Viva: 30)

Instructions:

1. There are **Four (4)** Questions. Answer all of them. All questions are of equal value. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.

1. a) Determine the value of $3^n \bmod n-1$. Where, 'n' is exact combination of all non-zero values of your ID. [15]

For example, if your ID is 18102033 then, $n = 181233$.

- b) Optimize the function $f(x, y, z) = x^2 + y^2 + z^2$, where the constraint given as— $x + 2y + 3z = n$. [15]

Where 'n' is sum of all digits of your ID.

For example, if your ID is 18102033 the $n = 1+8+1+0+2+0+3+3 = 18$.

2. a) Determine the probability of choose a number 'k' times standard deviation from the mean. Where $k = \text{last digit of your ID} + 1$. [6]

- b) Determine the arithmetic, geometric and harmonic mean of all digits of your ID. [3*4=12]

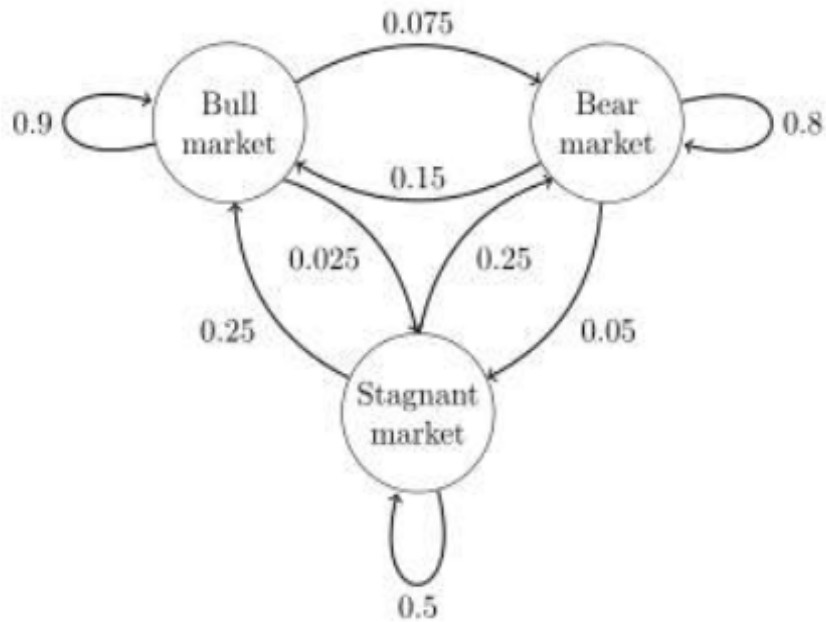
- c) Determine the mean, median and mode from all digits of your ID. [3*4=12]

3. a) Determine the Eigen Values and Eigen Vector from the following dataset— [7+8=15]

$X = \{\text{First three digits of your ID}\}$

$Y = \{\text{Last three digits of your ID}\}$

- b) Suppose the scenario of Dhaka Stock Exchange is represented by the following transition diagram— [15]



Determine the following possibility of occurrence—

Bull > Bear > Bear > Bull

Where the equivalent state of this transition is given as [Bull = 0.5, Bear = 0.3, Stagnant = 0.2]

4. a) Determine the convolution of the following signals— [20]

$$X = [-1 \ -3 \ -2 \ N \ 2]$$

$$Y = [2 \ 3 \ N \ -2]$$

Here, N is the sum of all digits of your ID and the position of N is $n = 0$.

- b) Draw the following signal— [5+5=10]

i. $u(n+a)$

ii. $r(-n-c)$

Where, $a = \text{your ID mod } 3 + 1$

$c = \text{your ID mod } 5 + 1$

Where the 'u' means unit step signal and 'r' means unit ramp signal.

Or,

- a) Calculate the expected value of getting Head and Tail in the following order— [20]

Every odd digit of your ID corresponds to Head and every even digit of your ID corresponds to Tail.

For example, if your ID is 113007 then the sequence of getting Head and tail is HHHTTH.

- b) Consider the recursive function, known as Ackermann—

[10]

$$A(m, n) = \begin{cases} n + 1, & \text{where } m = 0 \\ A(m - 1, 1), & \text{where } n = 0 \\ A(m - 1, A(m, n - 1)), & \text{otherwise} \end{cases}$$

Determine the value of $A(0, x)$. Where, $x = \text{your ID mod } 2 + 2$.