Time: 3.00 Hour.                                                                                   Full Mark: 50

Answer any (5) five of the following questions
You must answer each part of a question consecutively

1. a) Define *Electronic/digital signature* in accordance with the provisions of Information and Communication Technology Act 2006 (ICT Act-2006). Make a list of tasks where digital signature may be used in the present context of Bangladesh.                                      5
   b) Define computer and computer network in accordance with the provisions of ICT Act-2006. Generally, an Act is applied within a specific territory of a country but the ICT Act-2006 is an exception-Discuss.                                                                              5

2. a) When is an electronic record said to be sent by the sender and received by the receiver in accordance with the provisions of the ICT Act-2006.                                     5
   b) How is a digital signature created? Mention some names of the companies which issue digital signature in Bangladesh. Please provide their websites.                          5

3. a) What is controller of certifying authorities under ICT Act-2006? Describe its power and functions.                                                                                    5
   b) What do you mean by Cyber Tribunal? If anyone is aggrieved against the decision of Cyber Tribunal what is the remedy available for him?                                      5

4. a) Make a comparison between the ICT Act, 2006 and Digital Security Act, 2018 in terms of purpose and contents.                                                                  5
   b) Explain *critical information infrastructure* and *illegal entrance* in accordance with the provisions of Digital Security Act, 2018                                             5

5. a) There shall be a National Digital Security Council in Bangladesh. Write down the composition and powers of the National Digital Security Council.                          5
   b) If anyone illegally enters into a computer of another person with bad motive what will be the punishment?                                                                    5

6. a) Explain *Digital forgery* and *Digital fraud*. Mention the punishments of digital forgery and digital fraud in accordance with the provisions of Digital Security Act, 2018.       5
   b) Elaborate cyber terrorism in accordance with the provisions of Digital Security Act, 2018.                                                                                      5

7. Write short notes on i) Copyright ii) Trademark ii) Patent iv) Digital pornography v) Right to information.                                                                      5x2=10

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

| | |
|---|---|
| **Final Examination** **Fall 2019** | **B. Sc. Engineering 4<sup>th</sup> Year 1<sup>st</sup> Semester** |

**Final Examination**        **Fall 2019**        **B. Sc. Engineering 4th Year 1st Semester**
**Course Code: CSE 403**    **Course Title: Artificial Intelligence**    **Credits: 3**
**Full Marks: 150**                                          **Duration: 3 Hours**

**Instructions:**
1. There are Six (6) 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. | What is meant by intelligent agent? Discuss the properties of an intelligent agent. | 5 |
| | b. | Describe Allan Turing's test mechanism to determine the intelligence of a machine. | 10 |
| | c. | What is an expert system? Design and describe a simple rule-based expert system. | 10 |

**OR**

| | | | |
|---|---|---|---|
| 1. | a. | Define knowledge, meta-knowledge and hypothesis. Also give examples of each. | 5 |
| | b. | Represent the following knowledge using logical symbols or Prolog: "You can access the Internet from campus only if you are a computer science major or you are not a freshman." | 10 |
| | c. | With proper examples explain how we can handle a conflict situation. | 10 |

| | | | |
|---|---|---|---|
| 2. | a. | Classify agents and environments. | 10 |
| | b. | Consider a state space where the start state is 1 and the successor function for the state n returns two states, numbers 2n and 2n+1. Now goal state will be the first prime number of your list in 30 < prime number (goal state) <50. List the order in which nodes will be visited for the iterative deepening search strategy. | 10 |
| | c. | Differentiate between inductive and deductive knowledge with examples. | 5 |

**OR**

| | | | |
|---|---|---|---|
| 2. | a. | Write down the PEAS description of an autonomous medical diagnosis system. | 10 |
| | b. | Differentiate between greedy and A* search strategies from objective function's perspective. | 10 |
| | c. | How can we overcome the local traps in the gradient-based technique? | 5 |

| | | | |
|---|---|---|---|
| 3. | a. | What is game theory? Describe adversarial search for the tic-tac-toe game. | 15 |
| | b. | What is parsing? Describe a parse tree for the following sentence: | 10 |

1

"The dog saw a man in the park."

4. a. Represent the following expression using Semantic net: 15
Samina Chowdhury, the daughter of Mahmudun Nabi and Rashida Chowdhury,
is a renowned singer. She was born in Dinajpur on 1968. She prefers to sing
classical and modern songs. She is liked by all Bangladeshis because of her sweet
melodies.

   b. Show the algorithmic mechanism to transfer human mind map to computer. 10

5. a. Differentiate between fuzzy and probability citing an example. 5

   b. Delta University wants to select students for MS enrolment on the basis of 20
Undergraduate GPA and GRE scores. The maximum score of GPA is 4.0 and
that of GRE is 1600. Assume each score can be fuzzified into three categories:
High, Medium and Low, and the final decision would be Excellent, Very Good,
Good, Fair and poor. A student's GPA score is 3.2 and GRE score is 1000. What
decision can be taken about this student using a fuzzy system? You have to show
all membership graphs in converting crisp to fuzzy.

6. a. Explain two main genetic operators: cross-over and mutation. Why mutation is 10
important?

   b. It is necessary to optimize (maximize) the following function. Genetic algorithm 15
is a good way to optimize this function. Show the fitness for the first two
generations.

$$f(x) = \frac{x^2 - 7}{1 + 4x} \quad 0 \le x \le 255$$

2

**Instructions:**
There are **Six (6)** Questions. Answer all of them. All questions are of equal value. Part marks are shown in the margins
Non-programmable calculators are allowed.

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a.  On a given day, a dinosaur is either cheerful (C), afraid (A) or extinct (E).    05
    If it is cheerful (C) today, then it will be C, A or E tomorrow with probabilities
    0.8, 0.19 and 0.01 respectively.
    If it is afraid (A) today, then it will be C, A or E tomorrow with probabilities 0.6,
    0.34, and 0.06 respectively.
    Lastly, if it is already extinct (E) today, it will be C, A or E with probabilities of
    0, 0 and 1 respectively.
    Now, write the transitional probability matrix to model this scenario using
    Markov Chain with clearly identifying the states and transitions.

b.  Suppose, a dinosaur is afraid today.    10
    Now, use the transitional probability matrix that you wrote as the answer of
    question 1(a), and apply the Chapman-Kolmogorov formula to find out the
    probability of that dinosaur being extinct five (5) days from now.

c.  Apply your knowledge of Markov Chain to determine the probability of a    10
    dinosaur being extinct 10,000 years from now.
    [Hint: 10,000 years is a very long time. One may say it is an infinitely large
    time.]

2.  a.  Noman, Sadia and Munmun are three friends who took the course "Mathematics    08
        for Computer Science". It is known that the probability of a person passing this
        course is 0.3.
        Now, find out the probability that among the three friends, only one will pass this
        course.

    b.  Suppose, we consider a Random Variable, $X$ = the number of people passing the    05
        "Mathematics for Computer Science" course among n people.
        Then what type of Random Variable would that be and why?
        [Hint: Bernoulli, Binomial, or Geometric?]

    c.  Derive the formula for Expected value, $E[X]$, where $X$ is the Random Variable    12
        mentioned in question 2(b).

For example, if you think X is a Bernoulli Random Variable, then derive the formula for the expected value of a Bernoulli Random Variable

OR

2. a. What is the difference between discrete and continuous random variables? Is there any difference in their formulas of expected value? — 05

2. b. Find out the expected value of the following random variables — 20
    I.    Geometric Random Variable
    II.   Exponential Random Variable

3. a. Tonmoy is a dishonest student and he brought 3 books illegally in the exam hall. There was only one question in that exam and the answer to that question can be found only in one of the three books. So, Tonmoy started searching for the answer in those books. However, Tonmoy also has a short-term-memory-loss and he forgets which book he has already searched. — 15
If Tonmoy searches book 1, it will take him 2 hours to search the whole book, but the answer is not in that book.
If Tonmoy searches book 2, it will take him 5 hours to search the whole book, find the answer and write it in the script. DONE!!
If Tonmoy searches book 3, it will take him 3 hours to search the whole book, but the answer is not in that book.
Now, find out the Expected time required for Tonmoy to find the answer and finish his exam.

3. b. There is a total of 60 students in the 4-1 A section of CSE, UAP and they are arranging an election to select their class representatives. There are two candidates- Lamia and Tasnima. Each student will come one at a time and put their vote. — 10
Now, suppose Lamia won the election and got 39 votes. Find out the probability that Lamia was ahead of Tasnima during every step of the election. You need to explain the equation you are using to solve this problem.

4. a. Consider two baskets. The first contains two white and seven black balls, and the second contains five white and six black balls. We flip a fair coin and then draw a ball from the first basket or the second basket depending on whether the outcome was heads or tails. — 12
What is the conditional probability that the outcome of the toss was heads given that a white ball was selected?
[Hint: Bayes' formula]

4. b. Suppose, we have 3 text files and only one of them contains the letter 'm'. In general, the letter 'm' can be in any of the files. — 13
However, we have a special quick search ability which allows us to very quickly

search a file. But this quick search is not very accurate. If the letter 'm' is actually in a file. even then we have only 60% probability to find that letter 'm' in that file using quick search.

Now, suppose we have already searched file_1 but did not find the character 'm'. Given that, find out the probability that the letter 'm' is actually in file_1.

[Hint: If we let event, E= we have already searched file_1 but did not find the character 'm'.

Then we need to find out, P(file_1 | E) = ? (Bayes' formula)]

OR

4.  a.  In answering a question on a multiple-choice test, a student either knows the answer or guesses. Let $p$ be the probability that she knows the answer and $1-p$ the probability that she guesses. Assume that a student who guesses at the answer will be correct with probability $1/m$, where $m$ is the number of multiple-choice alternatives.

What is the conditional probability that a student knew the answer to a question given that she answered it correctly?

[Hint: Bayes' formula]                                                                  12

   b.  In the "Mathematics for Computer Science" course, there are two main textbooks- Concrete math book and probability book. There is a total of 7 misspelled words in the concrete math book and 13 misspelled words in the probability book. The concrete math book has a total of 800 words and the probability book has a total of 1000 words.

If Ashik choses a book randomly and then selects a word, what is the probability that he will find a misspelled word?                                               13

5.  a.  Suppose, a gambler places his bets on a game where he can either win $1 or lose $1. The probability that he will win $1 in that game is 40%.

The gambler starts placing bets with $i in his bank account. He will stop placing bets when-

He has lost all his money (he has $0), or

He has gained $N amount of money.

Now, model this scenario using Markov Chain and find out the probability that the gambler will reach $N starting from $i.                                               15

   b  Using your formula for the answer of 5(a), find out the probability that the gambler will reach $1,00,000 starting from $5000.                                     05

   c.  Go through your answer of 5(a). Can you explain what will happen if the probability of that gambler winning $1 becomes 50%, instead of 40%?           05

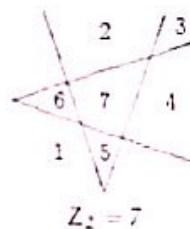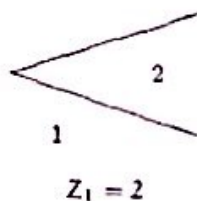6. a. Consider the Tower of Hanoi problem where 3 consecutive disks are of the same size (Triple Tower of Hanoi). 15 + 05
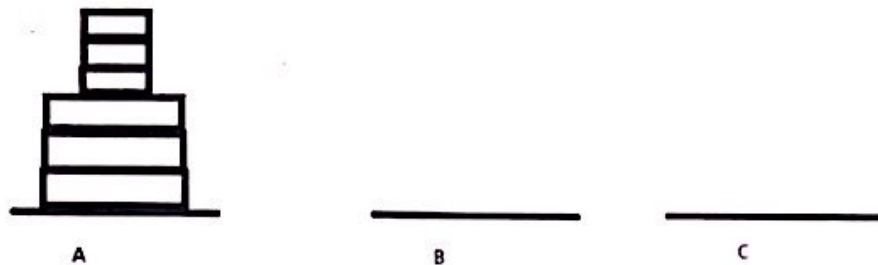


Deduce the recurrence relation for this problem and find out the minimum number of steps needed to move 5 disks from peg A to peg C.

b. Find out the maximum number of regions created in a plane by 4 zigs, i.e. $Z_4 = ?$ 05



$Z_1 = 2$

$Z_2 = 7$

## List of Important Formulas

$$E[X] = \sum x * P(x)$$

$$P\{X = i\} = p * (1 - p)^{i-1}$$

$$P\{X = i\} = \binom{n}{i} * p^i * (1 - p)^{n-i}$$

$$P(F1|E) = \frac{P(E|F1) * P(F1)}{P(E|F1) * P(F1) + P(E|F2) * P(F2) + \cdots}$$

$$P(E|F) = \frac{P(EF)}{P(F)}$$

$$f(x) = \lambda e^{-\lambda x}, \qquad x > 0$$

$$P^{(n+m)} = P^{(n)} * P^{(m)}$$

$$E[X] = E[X|A] * P(A) + E[X|B] * P(B) + \cdots$$

# UNIVERSITY OF ASIA PACIFIC

## Department of Computer Science and Engineering

### Final Examination, Fall-2019

### Program: B.Sc. Engineering (2nd Year/ 2nd Semester)

Course Title: Principles of Economics     Course No. ECN 201     Credit: 2.00

Time: 2.00 Hours                         Full Mark: 50

**Answer any Five out of Seven Questions. All Questions are of equal mark**

**Q-1** Discuss Price Elasticity of Demand covering such areas as (a) Elastic and Inelastic Demand and (b) Price Elasticity of Demand and Total Revenue. Illustrate with numerical examples and diagrams as considered appropriate.

**Q-2** Discuss Income and Cross-Price Elasticity of Demand. Illustrate with numerical examples as considered appropriate.

**Q-3** Discuss the Impact of an Excise Tax covering such areas as (a) The Effect of Price Elasticity of Demand, (b) The Effect of Price Elasticity of Supply and (c) Role of Elasticity in Tax Policy. Illustrate with appropriate diagrams.

**Q-4** Discuss Perfect Competition in the Short Run covering such areas as (a) Business's Demand Curve, (b) Revenue Conditions including Average Revenue and Marginal Revenue, and (c) Relationship between Revenue Conditions and Demand. Illustrate with appropriate schedules and diagrams.

**Q-5** Discuss Perfect Competition in the Short Run covering such areas as (a) Profit maximization of a Perfect Competitor and (b) Why should a business close including Business's Supply Curve and Market Supply Curve. Illustrate with appropriate schedules and diagrams.

**Q-6** Discuss Inflation covering such areas as (a) The Consumer Price Index (CPI) and (b) Nominal versus Real Income. Illustrate with appropriate numerical examples.

**Q-7** Discuss Unemployment covering such areas as (a) Labor Force Survey including the Participation Rate and (b) The Official Unemployment Rate including the drawbacks of Official Unemployment Rate. Also, discuss the Types of Unemployment. Illustrate with appropriate numerical examples.

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

| Final Examination | Fall 2019 | 4<sup>th</sup> Year 1<sup>st</sup> Semester |

Final Examination    Fall 2019    4th Year 1st Semester

Course Code: CSE 423    Course Title: Bioinformatics    Credits: 3.00

**Full Marks: 150**                                    **Duration: 3 hours**

<u>Instructions:</u>
1. There are Six (6) 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) Define GC-content of a genome sequence.    5
   b) Find GC-content of the reverse complement of the following RNA sequence:    5
      CCGCGAAUACGCUACGU
   c) Describe the process of Transcription of a DNA into RNA with appropriate figures.    15

2. a) How can we find the longest contiguous match (Longest Common Substring) of two given DNA sequences?    10
   b) Using the 'Edit Distance' algorithm, Find the minimum number of insert, update or delete operations required to convert the following sequence A to the sequence B.    15
      A: TCAGT
      B: AGTTA

### OR

   a) Propose an algorithm to find the longest palindromic substring of a given RNA sequence. Complexity of the proposed algorithm should not exceed $O(N^2)$ where N is the size of the RNA sequence.    12
   b) Find the Longest Common Subsequence of the following genome sequences.    13
      A: AREIGHMF
      B: AIGERHMI

3. a) Show output of pre-processing of the following pattern string P according to KMP algorithm.    15
      P: AGACAGAC
   b) Explain why Aho Corasick algorithm will be faster than KMP algorithm to find the occurrence of a set of patterns in a text sequence.    10

### OR

   a) Define hashing, double hashing and collision in hashing.    5
   b) Propose a Hash function to generate unique hash values for every possible DNA sequence of length = 6.    8
   c) Using your proposed function, find the frequency of the following pattern sequence P in the text sequence T.    12
      T: AAAAAAAAA
      P: AAAAAA

4. a) Explain the term Cross Validation for machine learning with an example.    5
   b) Formulate all necessary equations of Feed Forward and Back Propagation to design an Artificial Neural Network with one hidden layer of 4 nodes to train the following dataset.    20

| Input 1 | Input 2 | Input 3 | Output |
|---------|---------|---------|--------|
| 1 | 3 | 2 | 0 |
| 2 | 1 | 1 | 1 |

5. a) Briefly describe RNA secondary structure in your own words.    5

   b) Explain the recursive method to find the number of possible secondary structures of a given RNA sequence.    7

   c) Using Nussinov's algorithm, find the maximum number of base pairs possible in the secondary structure of the RNA sequence: ACUAUG    13

6. a) Sequence alignment is a way of arranging the sequences of DNA, RNA, or protein to identify    25 regions of similarity that may be a consequence of functional, structural, or evolutionary relationships between the sequences. Finding alignment between two given genome sequences is a classical problem of Bioinformatics.

An alignment of two strings s and t is defined by two strings s' and t' satisfying the following three conditions:

1. s' and t' must be formed from adding gap symbols "-" to each of s and t, respectively; as a result, s and t will form subsequences of s' and t'.

2. s' and t' must have the same length.

3. Two gap symbols may not be aligned; that is, if s'[j] is a gap symbol, then t'[j] cannot be a gap symbol, and vice-versa.

For example, the sequence alignment of the following two RNA sequences AUACG and UAACGA can be done as follows:

**A-UACG-**     A U-ACG -
**-UAACGA**

Notice that, the gaps are introduced only on those positions where the symbols of s and t do not match.

Propose an algorithm to find the alignment of two given genome sequences (DNA, RNA or Protein) and discuss the complexity of your algorithm.

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

**Final Examination**     **Fall 2019**     **4ᵗʰ Year 1ˢᵗ Semester**

**Course Code: CSE 405**      **Course Title: Operating System**      **Credits: 3**

**Full Marks: 150**             **Duration: 3 Hours**

**Instructions:**
1. There are Six (6) 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. What are the purposes of operating system to handle computer hardware? List out the functions. [8]

   b. Differentiate between uniprocessor and multiprocessor operating system with examples. [7]

   c. Define process and different states of a process. Draw the diagram showing transition among different process states. [10]

**OR**

   a. Define the three different managerial parts of an operating system. 'A 64-bit OS will work faster than 32-bit OS' – why? [10]

   b. What is PCB? List out the contents of PCB. Draw the diagram of PCB. When CPU need to switch from one process to another? [10]

   c. What are the differences between long term scheduler and short term scheduler? [5]

2.
   a. Illustrate multi-threading concept. How does it improves the speed of execution in CPU rather than that of multi-processing? [10]

   b. 'Cooperating processes are more advantageous than the independent process'-Why? Explain. [6]

   c. Explain the critical section problem. Resource should be locked and released- When? [9]

3.
   a. Briefly explain bounded buffer problem. Write down the procedures for producer and consumer using semaphore to avoid race condition. [10]

   b. State the critical section in Dining Philosopher problem. Write down the procedure for the philosopher along with deadlock handling. [15]

**OR**

   a. Briefly describe the four different conditions to arise deadlock. [15]

   b. Explain virtual memory using paging. [10]

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Consider the following set of processes, with the estimated CPU burst given in milliseconds, [25] and lower priority numbers corresponding to higher CPU priority. The processes are arrived according to the arrival time given in the table:

| Process | Burst Time | Arrival time | Priority |
|---------|-----------|--------------|----------|
| P1 | 2 | 1 | 1 |
| P2 | 7 | 2 | 1 |
| P3 | 1 | 4 | 2 |
| P4 | 1 | 4 | 3 |
| P5 | 4 | 3 | 1 |
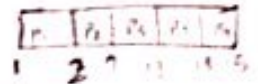
a. Draw the Gantt charts that illustrate the execution of these processes using the following scheduling algorithms:
   i.   FCFS
   ii.  preemptive SJF
   iii. preemptive priority

b. Calculate the turnaround time of each process for each of the scheduling algorithms in part (a).

c. Calculate average waiting time of each process for each of these scheduling algorithms in part (a).

d. Find out the shortest average waiting time among these scheduling algorithms.

Consider the given page reference string: [25]

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2
   and also consider the memory has three working frames those initially empty

a. Find out the sequence of page allocation using the following algorithms
   i.   LRU
   ii.  FIFO
   iii. Optimal page replacement algorithm

b. Compare the page fault ratio among them.

6. Consider the following snapshot of a system with processes P1, P2, P3, P4 and P5 and resources [25] A, B, C, D. It is given that the resources A, B, C and D has instances A=3, B=14, C=12 and D=12

| Allocation | Max |
|---|---|
| A B C D | A B C D |
| P0 0 0 1 2 | 0 0 1 2 |
| P1 1 0 0 0 | 1 7 5 0 |
| P2 1 3 5 4 | 2 3 5 6 |
| P3 0 6 3 2 | 0 6 5 2 |
| P4 0 0 1 4 | 0 6 5 6 |

i. Calculate the Need matrix and current available resources.

ii. Find out the current sequence of processes is safe or unsafe? If unsafe then derive the safe sequence of processes using Banker's algorithm.