1507E202 Candidate's Seat No :_____

M.Sc.(AI & ML) (Sem.-1) Examination
Mathematical Foundation
Time : 3-00 Hours]   **July 2019**   [Max. Marks : 100

Note : 1. Write both the sections in separate answer books.

2. Figures to the right indicate full marks.

3. Make necessary assumptions wherever necessary.

SECTION-I

Q 1. Attempt any three :   [18]

(a) Define Row-Echelon Form of a matrix. Find the row-echelon form of the matrix

$$A = \begin{bmatrix} 2 & 4 & 6 \\ 1 & 2 & 9 \\ -2 & 3 & 0 \end{bmatrix}.$$

(b) Test for consistency and solve

$$5x + 3y + 7z = 4$$
$$3x + 26y + 2z = 9$$
$$7x + 2y + 10z = 5.$$

(c) Determine the rank of the matrix

$$A = \begin{bmatrix} 3 & -1 & 2 \\ -6 & 2 & 4 \\ -3 & 1 & 2 \end{bmatrix}.$$

(d) Use Gauss-elimination method to solve following system of equations.

$$x + y + 2z = 8$$
$$-x - 2y + 3z = 1$$
$$3x - 7y + 4z = 10.$$

P. T. O.

2 (a) Determine the eigen values of the matrix [8]

$$A = \begin{bmatrix} 2 & -2 & 2 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$$

(b) Define eigen vector of a matrix. Find the eigen [8] vectors of

$$\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$$

OR

(b) Find the matrix B reducing [8]

$$A = \begin{bmatrix} -1 & 1 & 2 \\ 0 & -2 & 1 \\ 0 & 0 & -3 \end{bmatrix}$$

to the diagonal form by the transformation $\bar{B}^{-1}AB$.

3. Attempt the following (Any two):

(a) Explain independent and mutually exclusive [8] events.
Suppose that the probability of a boy to be born is 70% and that of a girl to be born is 30%. For a couple having four children, what are the probabilities of
(i) All 4 boys or all 4 girls?
(ii) 3 girls and 1 boy ?

[8]

(b) A, B and C toss a coin in succession on the understanding that the first one to throw a head wins. What are their respective chances of winning?

(c) If 10 per cent of the bolts produced by a machine [8] are defective, determine the probability that out of 5 bolts selected at random (a) none (b) one (c) at most one bolt will be defective.

SECTION - II

Q 4. Attempt any <u>three</u> from the following: [18]

(a) Define subspace of a vector space.
Show that the set $W = \{(1, x) \mid x \in R\}$ is a subspace of R^2 under the operations

Addition: $[1, x] + [1, y] = [1, x+y]$, $x, y \in R$.

Scalar multiplication: $K[1, x] = [1, Kx]$, K is any scalar.

(b) Express a vector $W = [7, 4, -3]$ as a linear combination of $v_1 = [1, -2, -5]$ and $v_2 = [2, 5, 6]$.

(c) Do $p_1 = 2 + 2x + 2x^2$, $p_2 = 3x^2$ and $p_3 = x + x^2$ span P_2?

(d) check, whether the set $s = \{[1, 2, 5], [3, 6, -5]\}$ in R^3 is linearly independent or dependent.

P. T. O.

Q 5　Attempt any two from the following:　[16].

(a)　List row vectors and column vectors of the　[8]
matrix

$$A = \begin{bmatrix} 1 & -1 & 2 & 3 \\ 4 & 6 & -3 & 5 \\ 3 & 2 & 0 & -1 \end{bmatrix}.$$

(b)　Define row space and column space of a matrix. [8]
Find the row space and column space of the
matrix

$$A = \begin{bmatrix} 1 & -1 & 5 \\ 2 & -3 & 6 \\ -1 & 2 & 0 \\ 4 & 1 & 1 \end{bmatrix}.$$

(c)　Find a basis for the row space of　[8]

$$A = \begin{bmatrix} 1 & -1 & 3 \\ 5 & -4 & -4 \\ 7 & -6 & 2 \end{bmatrix}.$$

OR

(c)　Find the null space of the matrix　[8]

$$A = \begin{bmatrix} 1 & 4 & 5 & 6 & 9 \\ 3 & -2 & 1 & 4 & -1 \\ -1 & 0 & -1 & -2 & -1 \\ 2 & 3 & 5 & 7 & 8 \end{bmatrix}.$$

Q.6. Attempt any __two__ from the following: [16]

(a) Check the linearity of the following transfor-   [8]
mation
$$T: R^3 \longrightarrow R^3$$
defined by $T(x_1, x_2, x_3) = (x_1+1, x_2+2, x_3+3)$.

(b) Find the formula for norm and distance in R^2 [8]
with Euclidean inner product $\langle u, v \rangle = u_1 v_1 + u_2 v_2$
where $u = [u_1, u_2]$, $v = [v_1, v_2]$.
   Hence find the norm of $(1,0)$ and $(0,1)$ and
distance between $(1,0)$ and $(0,1)$.

OR

(b) Verify the ~~chart~~ Cauchy-Schwarz inequality for   [8]
the vectors $1-x^2$ and $1-x+x^2$ in P_2 with inner
product
$$\langle p, q \rangle = \int_{-1}^{+1} p(x) q(x) \, dx.$$

(c) Construct an orthogonal basis of the subspace   [8]
spanned by the vectors $v_1 = [1,-4, 0, 1]$, $v_2 = [7,-7,-4,1]$
of a Euclidean inner product space R^4.

1607E207

Candidate's Seat No :＿＿＿＿＿

M.Sc. (Sem.-1) (A.I. & M.L.) Examination

~~Introduction to~~ Programming with Python

Time : 3-00 Hours]

July 2019

[Max. Marks : 100

SECTION I

Q:1   Answer the following (Any Two):   [20]
1. Explain built-in data types of python.
2. What is List in python? Explain any five methods of list. Differentiate list with tuple.
3. Explain Recursion in python with example of Fibonacci series and Palindrome testing.

Q:2   Answer the following (Any Two):   [16]
1. What is class and Object?? Explain Encapsulation and Information hiding in Python.
2. Explain with example built-in function that used to iterate over number sequence
3. How to implement method overriding in Python? Demonstrate with an example.

Q:3   Answer the following (Any Two):   [14]
1. What is dictionary in Python? What are the advantages of the Python dictionary type?
2. Write a python program to multiply and add two matrices.
3. Given list :

   lst = [20 , 12 , -13 , 4 , 5 , 3 , -6 , 2]

   Evaluate the following operation:

   a) lst[-5:3]   b) lst[1:5]

   c) lst[::-1]   d) lst[-3]

   e) lst[0:1]   f) lst[:4]

   g) lst[:]

P.T.O.

Q:4   Answer the following(Any three):   [18]
       1. What are various file positions methods? Explain with example
       2. Explain if-elif condition. When do we use it? Explain with an example.
       3. Demonstrate any six operation on strings
       4. What is testing? Write down types of testing and explain Black box testing.

Q:5   Answer the following: [12]
      a) Explain Merge short with an example.
      b) Discuss with an example, exception with arguments in Python

Q:6   Answer the following(Any Two):   [20]
       1. What are the different ways of importing modules? Which one is beneficial?
       2. Write a python program to read contents of the text file and write into another
       3. Write a python program that takes a number from user and calculate factorial, check whether it is prime or not and print its multiplication table

1707E212   Candidate's Seat No :_____

M.Sc. (Sem.-1) (A.I. & M.L.) Examination
Introduction to Artificial Intelligence

Time : 3-00 Hours]   **July 2019**   [Max. Marks : 100

Section - I

Q-1 Answer the following: (Any 10)   **[20]**
1. Define Artificial Intelligence.
2. What are the characteristics of an AI technique?
3. What are Heuristics? Give an example.
4. What do you understand by State Space Search? Give an example.
5. What are Production Systems?
6. How Procedural knowledge differs from Declarative knowledge.
7. Which functions are used in Generate and Test algorithm?
8. What is the difference between Graph based and Tree based search?
9. What are Frames? Give an example.
10. Draw a labeled diagram for Single Layer Perceptron.
11. What are issues in Knowledge Representation?

Q-2 Answer the following questions: (Any 2)   **[20]**
1. Explain the method of Simple Hill-Climbing for searching. What are its problems?
2. Discuss 7 problem characteristics of a problem giving proper examples.
3. Represent the following sentences using Semantic Networks:
   a. Every student loves to read books.
   b. I have a beautiful brown winter coat.

Q-3 Convert the following statements into Predicate Logic: **[10]**
1. Mary likes everyone that plays chess.
2. Venus is near sun and does not have tail.
3. Laxman eats everything that Ram eats.
4. All kings wear a crown on their head.
5. Everyone likes ice cream.

Section - II

Q-4 State whether the following statements are TRUE or FALSE? Give reasons for your [20] answer. No reasons, no marks.
1. Frames in artificial intelligence are derived from semantic nets.
2. XOR problem is linearly separable.
3. Fuzzy logic is extension of Crisp set with an extension of handling the concept of Partial Truth.
4. Using logic to represent and reason we can represent knowledge about the world with facts and rules.
5. Probabilistic reasoning is based on random variables.
6. Bayes rule can be used to decrease complexity of a problem.
7. A perceptron adds up all the weighted inputs it receives, and if it exceeds a certain value, it outputs a 1, otherwise it just outputs a 0.

P.T.O.

8. Back propagation networks transmit errors back through the network to adjust the inputs.
9. A Truth Maintenance System adjusts the knowledge base when a truth changes.
10. Like probability theory, the measure of belief and measure of disbelief adds to 1.

Q-5 A. Give appropriate examples to differentiate between crisp theory and fuzzy theory. [05]

B. **Write short notes on: (Any 3)** [15]
   a) Certainty Factors
   b) Backward Reasoning
   c) Multilayer Neural Networks
   d) Hopfield Networks

Q-6 **Answer the following questions: (Any 2)** [10]
1. Discuss the steps involved in Natural Language Processing giving examples of each step.
2. What is the importance of Directed Graphical Models?
3. Distinguish between:
   a. Unsupervised Vs. Reinforcement Learning
   b. Monotonic Vs. Non-Monotonic Reasoning

END OF PAPER

1807E217   Candidate's Seat No :_____

M.Sc. (Sem.-1) (A.I. & M.L.) Examination
Object Oriented Concepts & Programming Using C⁺⁺

Time : 3-00 Hours]

July 2019

[Max. Marks : 50

Note : (1) Write both the sections in the separate answer books
   (2) Figures to the right indicate full marks.
   (3) Make necessary assumptions wherever necessary.

SECTION-I

Q.1   Answer the following   [8]
(a) What is object oriented programming ? What are its main characteristics ?
(b) Define a class of employees. It should contain employee number, name, address, and number of dependents for the employees. Define an array of 20 employees. Now write a simple for loop to read information about the employees. At the end, display all employees with more than two dependents.

Q.2   Answer the following (Any four)   [8]
(a) What do you understand by constructor and destructor? Explain. When it becomes essential for programmer to write destructor in a class? Explain with example.
(b) Distinguish between private, protected and public visibility specifiers.
(c) What are the advantages of inline functions ? Explain.
(d) Explain the advantages and disadvantages of constructing an object dynamically
(e) What is is-a and has-a relationships? How are they implemented in C++?
(f) What is a virtual function ? Why do we need virtual functions ? When do we make a virtual function "pure" ? What are the implications of making virtual function pure virtual function ?

Q3   Compare & Contrast the following   [9]
(a) Static members & Non static members of the class
(b) Inline function, preprocessor macro & normal function
(c) Function overloading and function templates

P. T. O.

SECTION-II

Q4   Answer the following

    (a)   Explain the use of following functions :   [6]
            (i)   fseek()
            (ii)   feof()
            (iii)   fread()
            (iv)   fopen()

    (b)   What are the advantages of saving the data in binary form ?   [3]

Q.5   Answer the following   [8]

    (a)   How do the I/ O facility in C++ differ from that in C ?

    (b)   Explain conversion from class to basic type giving suitable example.

OR

Q.5   Answer the following   [8]

    (a)   What is **this** pointer ? Explain the use of **this** pointer giving suitable example.

    (b)   What is function template ? Write a function template for searching an element in a given array.

Q.6   Write short notes on the following (Any Two)   [8]
         (a) Run Time Polymorphism
         (b) Namespace
         (c) Exception Handling
         (d) Manipulators