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2103E877

Candidate's Seat No : 10014

M.Sc. Sem-1 (AIML & AIML-Defence Specific) Examination

Mathematical Foundations

Time : 3-00 Hours] **March 2022** **[Max. Marks : 100**

Instructions

1. **All questions are compulsory.**
2. **Read each question carefully.**

SECTION-I

Q1. Find the equation of the line parallel to the line passing through (5, 7) and (2, 3) and having x intercept as -4?

[10 marks]

Q2. *Consider* $u_1 = (1, 1, 0)$ *and* $u_2 = (2, 1, 1)$ *in* R^3. *Calculate orthogonal basis.*

[7.5+7.5=15 marks]

Q3. *Calculate all first order derivative of* $w = x^2y - 10y^2z^3 + 43x - 7\tan(4y)$.

[5+5+5=15 marks]

Q4. Write out the Taylor Series expansion for f(x)=$7x^2 - 6x + 1$ about x=2?

[10 marks]

SECTION-II

Q5. In a class of 120 students roll numbered 1 to 120, all even roll numbered students opt for Physics, those whose roll numbers are divisible by 5 opt for Chemistry and those whose roll numbers are divisible by 7 opt for Math.

I. How many students opt for none of the three subjects?

II. Draw Venn Diagram?

[15+5=20 marks]

Q6. *Given* $h(z) = \begin{cases} 6z & z \leq -4 \\ 1 - 9z & z > -4 \end{cases}$ Calculate limit if exists

(i) $\lim_{x \to 7} h(z)$

(ii) $\lim_{x \to -4} h(z)$

[5+5=10 marks]

Q7. *Consider the change of bases matrix* $A = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$, *then write the new transformed vector for* $v = (2, 2)$?

[10 marks]

Q8. *Find the maximum and minimum of* $f(x) = 5x - 3y$ *subject to the constraint* $x^2 + y^2 = 136$?

[5+5=10 marks]

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2203E885

Candidate's Seat No : 10014

M.Sc. Sem-1 (AIML & AIML-Defence Specific) Examination

Problom Solving with Python

March 2022

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

SECTION – I

Q1. Give difference between **(ANY FOUR).** Demonstrate through proper examples: [16]

i. Local and global variable
ii. Script and program
iii. List and Tuple data type
iv. Interpreter and compiler
v. Push and Pop operations in stack
vi. Error and Exception

Q2. Answer the following: [18]

i. Explain the Python Execution model. List the popular tools to write and run Python scripts
ii. Give the rules of naming a valid identifier with examples. What is the method for checking if a name is valid one
iii. Python presents dynamic typing. Comment.
iv. Numeric data types in Python are immutable. Justify this statement through the id() method.
v. The output of print(1.1+2.2) will be 3.3000000000000003. Give reasons and how you can resolve it.
vi. How can you extract real and imaginary parts of complex number ?

Q3. Explain different exception handling methods in python (built-in). Explain the syntax of implementing Python handling. [16]

OR

Q3. With respect to functions in Python, what are the following? [16]

i. namespace
ii. docstrings
iii. return type
iv. Scope and Lifetime of variables
v. Pass by reference vs value
vi. The Anonymous Functions
vii. Recursion
viii. Default argument passing

SECTION – II

Q4. i. Give output of: [16]

my_tuple = ('p' , 'r', 'o', 'g', 'r', 'a', 'm')

a) print(my_tuple[1:4])
b) print(my_data[:4])
c) print(my_data[4:-1])
d) print(my_data[:])

ii. ASCII is subset of Unicode. Justify
iii. List down characteristics of set data type in Python.
iv. What is the use of break and continue in loops? Give example

P.T.O

Q5. Draw flowchart and write pseudo code for ANY FOUR given loop exercises: [16]

(a) Write a Python program which iterates the integers from 1 to 50. For multiples of three print "Fizz" instead of the number and for the multiples of five print "Buzz". For numbers which are multiples of both three and five print "FizzBuzz".

(b) Write a Python program to find numbers between 100 and 400 (both included) where each digit of a number is an even number

(c) Write a Python program to sum of two given integers. However, if the sum is between 15 to 20 it will return 20.

(d) Write a Python program to create the multiplication table (from 1 to 10) of a number

(e) Write a Python program to remove and print every third number from a list of numbers

(f) Write a Python program to get the third side of right angled triangle from two given sides

Q6. Define array and explain methods in Python for performing following using array module: [18]

a) Traverse

b) Insertion

c) Deletion

d) Search

e) Update

OR

Q6. For NumPy in Python, what are the following: [18]

a) object type

b) common dtypes available

c) attribute to find dimensions

d) attribute to change the shape of array to a specific shape length of each element of array in bytes

e) attribute to create array of zeroes and ones

f) create array with numerical values in range (1,10) with step size of 2

g) get all values in array >10

2303E889

Candidate's Seat No : 10014

M.Sc. Sem-1 (AIML & AIML-Defence Specific) Examination

Introduction to Artificial Intellegence

March 2022

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

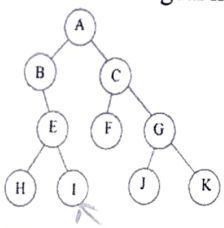
Instructions:

1. Figures to the right indicate full marks
2. Each section should be written in a separate answer book
3. Be precise and to the point in your answer

SECTION-I

1. **Answer the following questions to the point: (Any Ten)** **[20]**
   - i. Write 2 definitions of Artificial Intelligence.
   - ii. Define: Rational Agent
   - iii. Show a sample State Space representation of 8 puzzle problem.
   - iv. Differentiate between: Procedural and Declarative knowledge.
   - v. What role does Heuristics play in Searching?
   - vi. List the Task Domains of Artificial Intelligence.
   - vii. Why is Generate and Test known as Blind Search Method?
   - viii. Explain Local Maxima.
   - ix. Draw the setup of Turing Test.
   - x. Give example of an Intelligent Agent with Episodic environment.
   - xi. Write one point of difference between Monotonic and Non-monotonic Production Systems.

2. **Do as directed: (Any 4)** **[20]**
   - i. Traverse the following tree with initial node A and goal node I using Breadth First Search.



   - ii. Represent the sentence using Semantic Nets.
     - John watched a comedy movie with Lee in multiplex.
   - iii. Represent the sentence using Conceptual Dependency.
     - Pony will eat salad with a fork.
   - iv. Evaluate 7-Problem Characteristics of Tower of Hanio Problem.
   - v. What do you understand by PEAS? Write PEAS description for an Automated Traffic Controller.

3. **Consider the following sentences:** **[10]**
   1. Everyone who loves all animals is loved by someone.
   2. Nobody loves those who kill an animal.
   3. Ben loves all animals.
   4. Either Ben or Andy killed Pussy.
   5. Andy is friend of Ketty.
   6. Pussy is a white little cat of Ketty.

   a) Translate these sentences into formulas in predicate logic.
   b) Find "Did Ben kill Pussy?" using Backward Chaining.

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SECTION-II

4. **Answer the following questions in detail (Any Five):**

i. Explain any one real-time Expert System of your choice.

ii. Distinguish between forward and backward chaining with appropriate examples.

iii. Explain A* Algorithm with the help of an example.

iv. Why do you think Uncertainty exist in real world? Support your answer with Belief Theory.

v. Explain Alpha beta Pruning method with the help of an example.

vi. What are Expert Systems? Where are they used? Explain each component of Expert system.

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2403E894

Candidate's Seat No : 10014

M.Sc. Sem-1 (AIML & AIML-Defence Specific) Examination

Object Oriented Concepts & Programming using C++

March 2022

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

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

SECTION-I

Q1 **Attempt the following.** [18]

(a) Explain difference between C and C++?
(b) Explain static data members in detail.
(c) What is destructor? Why we need it.

Q2 **Attempt the following.** [16]

(a) What is constructor? Explain explicit and implicit constructor in detail.
(b) Explain the syntax and structure of friend function in C++. Explain the situation when we can use friend function.

OR

(a) What is array of object? How we can use array of object.
(b) Explain MIL with example.

Q3 **Attempt the following.** [16]

(a) Define flowing terms:
1. Inline function
2. Object based Programming and Object Oriented Programming
3. copy constructor
4. User defined datatype

(b) Explain function overloading in C++.

SECTION-II

Q4 **Attempt the following.** [18]

(a) Explain Unary and Binary Operator Overloading with example.
(b) Explain IOS member functions for formatting.
(c) What is inheritance? Explain multiple Inheritance and discuss the problem with the multiple inheritance and how to solve that?

Q5 **Attempt the following.** [16]

(a) What is template function? Explain non generic parameter in template function with example.
(b) Explain the need of friend as operator function in overloading an operator.

(P.T.O)

E 894 - 2

OR

(a) What is Class template? Explain classes with multiple generic data types.
(b) Explain derivation using different access modifier.

Q6 **Attempt the following.(Any Four)** [16]

(a) Explain Static data member in class template.
(b) Explain the advantages of C++ I/O over C I/O.
(c) Explain file handling methods.
(d) Explain runtime polymorphism.
(e) Explain components of STL.

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2503E897

Candidate's Seat No : 1 0 0 1 4

M.Sc. Sem-1 (AIML & AIML-Defence Specific) Examination

Linear Algebra and Numerical Methods

March 2022

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

SECTION - I

Q. 1 Answer any 5 of the following in one or two sentences: (10)

a) What is the significance of diagonal dominance?

b) Mention any one stopping criteria to find the root of an equation.

c) What is the necessary condition for matrix multiplication?

d) Suppose A and B are two matrices. The second column of matrix B is all zeros. What can you say about the second column of matrix A.B?

e) In finding a root of the equation $x^3 - x - 10 = 0$ by false position, if the root lies between a =2 and b =3, find the first approximate value of c.

f) Find any one interval which contains the root of $x^2 - x - 10 = 0$

Q. 2

a) Find a root of $x^4 - x - 10 = 0$ by Newton–Raphson Method (10)

b) Explain the advantages and disadvantages of False Position method (10)

OR

Q.2

a) Find a root of $x^4 - x - 10 = 0$ by Secant Method (10)

b) Explain the advantages and disadvantages of Bisection method (10)

Q. 3 Attempt any two (20)

a) Solve the following system of equations by Gauss-elimination method

$$x_1 - x_2 - 2x_3 = -5$$
$$2x_1 + 3x_2 + x_3 = 5$$
$$2x_2 + 3x_3 = 8$$

b) Solve the following using Cramer's Rule

$$x + 2y + 3z = -5$$
$$3x + y - 3z = 4$$
$$-3x + 4y + 7z = -7$$

c) Find the Inverse of the following matrix using Gauss-Jordan method

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

d) Explain the difference between singular and non-singular matrix

P. T. O.

E897-2

SECTION - II

Q. 4 Answer the following in one or two sentences: (10)

a) How do NP Hard problem differ from NP Complete problems?

b) To which of class do the following problem belong?

i) Vertex Cover problem

ii) Sorting

c) What do you mean by quadratic form of a matrix?

d) What is the first principal component?

e) Name the method used to calculate the largest eigen value and eigen vector.

Q. 5

a) Diagonalize the following matrix: (10)

$$\begin{bmatrix} 2 & 3 \\ 4 & 1 \end{bmatrix}$$

b) Compute the Characteristic equation, eigen values and eigen vectors of the following matrix: (10)

$$\begin{bmatrix} 3 & -1 \\ -1 & 3 \end{bmatrix}$$

OR

Q. 5

a) Let $A = PDP^{-1}$ and compute A^4 (10)

$$P = \begin{bmatrix} 5 & 7 \\ 2 & 3 \end{bmatrix} \text{ and } D = \begin{bmatrix} 2 & 0 \\ 0 & 1 \end{bmatrix}$$

b) Explain any one application of Singular Value Decomposition (10)

Q. 6 Attempt any two (20)

a) Explain the importance of Learning Rate in Gradient descent method.

b) Explain any one application of PCA

c) What do you understand by NP complete problems. Give one example.