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## Seventh Semester B.E. Degree Examination, July/August 2022 Artificial Intelligence and Machine Learning

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. What is Artificial Intelligence? Discuss the branches of Artificial Intelligence. (10 Marks)  
 b. What is a state space? Explain the concept of state space representation using the water jug problem (10 Marks)

OR

- 2 a. Explain any two AI techniques for solving tie-tar-toe problem. (10 Marks)  
 b. Write the algorithms for breadth first search and depth-first search. Enlist the advantages of each. (10 Marks)

### Module-2

- 3 a. Explain the properties of a good knowledge representation system. (04 Marks)  
 b. Define the following terms W.A.F machine learning : (i) Concept learning (ii) Inductive learning hypothesis (iii) Consistent hypothesis (iv) Version space (v) General Boundary (vi) Specific boundary. (06 Marks)  
 c. Apply candidate elimination algorithm on the following data set to obtain the complete version space.

Example	Sky	Air Temp	Humidity	Wind	Water	Forest	Enjoy
1	Sunny	Warm	Normal	Strong	Warm	Same	Yes
2	Sunny	Warm	High	Strong	Warm	Same	Yes
3	Rainy	Cold	High	Strong	Warm	Change	NO
4	Sunny	Warm	High	Strong	Cool	Change	Yes

(10 Marks)

OR

- 4 a. Explain the use of predicate logic as a way of representing knowledge using the following sentences :

i) Marcus was a man.	v) All Romans were either loyal to Caesar or hated him
ii) Marcus was a Pompeian.	vi) Everyone is loyal to someone.
iii) All Pompeian were Romans	vii) People only try to assassinate rulers they are not loyal to.
iv) Caesar was a ruler.	viii) Marcus tried to assassinate Caesar.

(10 Marks)

- b. Write Find-S algorithm. Apply the same on the following data set for the target "Play Tennis".

Day	Outlook	Temperature	Humidity	Wind	Play Tennis
1	Sunny	Hot	High	Weak	No
2	Sunny	Hot	High	Strong	No
3	Overcast	Mild	High	Weak	Yes
4	Overcast	Mild	Normal	Weak	Yes
5	Overcast	Cool	Normal	Weak	Yes

(10 Marks)

### Module-3

- 5 a. Define the following : (i) Decision tree (ii) Entropy (iii) Information gain (iv) Restriction Bias (v) Preference Bias (05 Marks)  
 b. Write ID3 algorithm to construct decision tree. (05 Marks)

- c. Construct a decision tree for the following data set to find whether a seed is poisonous or not.

Example	Colour	Toughness	Fungus	Appearance	Poisonous
1	Green	Soft	Yes	Wrinkled	Yes
2	Green	Hard	Yes	Smooth	No
3	Brown	Soft	No	Wrinkled	No
4	Brown	Soft	Yes	Wrinkled	Yes
5	Green	Soft	Yes	Smooth	Yes
6	Green	Hard	No	Wrinkled	No
7	Orange	Soft	Yes	Wrinkled	Yes

(10 Marks)

OR

- 6 a. Design a perceptron that implements AND function. Why is that a single layer perceptron cannot be used to represent XOR function? (05 Marks)
- b. Derive an equation for gradient descent rule to minimize the error. (05 Marks)
- c. Write an algorithm for back propagation algorithm which uses stochastic gradient descent method. Comment on the effect of adding momentum to the network. (10 Marks)

**Module-4**

- 7 a. Define Maximum Likelihood (ML) hypothesis. Derive an equation for ML hypothesis using Bayes theorem. (05 Marks)
- b. A patient takes a lab test and the result comes back positive. It is known that the test returns a correct positive result in only 99% of the cases and a correct negative result in only 98% of the cases. Furthermore, only 0.08 of the entire population has this disease.
- (i) What is the probability that this patient has Cancer? (05 Marks)
- (ii) What is the probability that he does not have Cancer? (05 Marks)
- c. Write EM algorithm and explain. (10 Marks)

OR

- 8 a. Write Brute-force Maximum A Posterior (MAP) learning algorithm. (05 Marks)
- b. Describe the features of Bayesian learning methods. (05 Marks)
- c. Estimate conditional probabilities of each attributes {Colour, Legs, Height, Smelly} for the species classes : {M, H} using the data given in the table. Using those probabilities estimate the probability values for the new instance – {Colour = Green, Legs = 2, Height = Tall and Smelly = NO}

Example	Colour	Legs	Height	Smelly	Species
1	White	3	Short	Yes	M
2	Green	2	Tall	No	M
3	Green	3	Short	Yes	M
4	White	3	Short	Yes	M
5	Green	2	Short	No	H
6	White	2	Tall	No	H
7	White	2	Tall	No	H
8	White	2	Short	Yes	H

(10 Marks)

**Module-5**

- 9 a. Write K-Nearest neighbor algorithm for approximation of a discrete-valued target function and also for a real valued target function. (10 Marks)
- b. Explain CADET system using case based reasoning. (10 Marks)

OR

- 10 a. What is reinforcement learning? Explain the concepts of reinforcement learning problem and its characteristics. (10 Marks)
- b. Derive an expression for a function. Using the same, write an algorithm for learning. (10 Marks)



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## Seventh Semester B.E. Degree Examination, July/August 2022 Big Data Analytics

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Define Data, Web data, Big data. Also explain structured, semistructured and unstructured data. (10 Marks)  
b. List and explain the characteristics of big data. Illustrate by considering an example of E-commerce, how big data is used. (10 Marks)

OR

- 2 a. With a neat diagram, explain the function of each of the five layers in big data architecture design. (12 Marks)  
b. How does Berkeley Data Analytics stack help in analytics tasks? (08 Marks)

### Module-2

- 3 a. With a neat diagram, explain Hadoop main components and ecosystem components. (08 Marks)  
b. Brief out the features of Hadoop HDFS? Also explain the functions of Name Node and Data Node. (08 Marks)  
c. Explain any two HDFS commands with example. (04 Marks)

OR

- 4 a. Explain the following:  
(i) HDFS block replication (ii) HDFS safe mode.  
(iii) Rack awareness (iv) Name Node high availability. (12 Marks)  
b. Discuss the Apache sqoop Import and Export methods with neat diagrams. (08 Marks)

### Module-3

- 5 a. List and compare the features of Big Table, RC, ORC and Parquet data stores. (10 Marks)  
b. With example explain key-value store. (10 Marks)

OR

- 6 a. Discuss the usage of MongoDB, Cassandra, CouchDB, Oracle NoSQL and Riak. (10 Marks)  
b. List the Pros and Cons of distribution using sharding. (05 Marks)  
c. Give the comparison between NoSQL and SQL/RDBMS. (05 Marks)

### Module-4

- 7 a. Describe MapReduce Execution steps with a neat sketch. (12 Marks)  
b. How node failure can be handled in Hadoop? Discuss. (08 Marks)

OR

- 8 a. With a neat diagram, describe Hive integration and work flow steps. (10 Marks)  
b. Explain with Return type and Syntax the Hive built-in functions. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

**Module-5**

- 9 a. Discuss Regression Analysis using Linear and Non-linear regression models. (10 Marks)  
b. Explain with an example Apriori algorithm to evaluate candidate key. (10 Marks)

**OR**

- 10 a. Write a note on:  
(i) Web mining  
(ii) Web content mining.  
(iii) Web usage mining. (12 Marks)  
b. How the Cliques discover communities from social network analysis? (04 Marks)  
c. Define a Page Rank. (04 Marks)

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**Seventh Semester B.E. Degree Examination, July/August 2022**  
**Advanced Computer Architectures**

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

**Module-1**

- 1 a. Explain the elements of modern computer system with neat diagram. (10 Marks)  
 b. Describe with a neat diagram, different shared memory multiprocessor models. (10 Marks)

**OR**

- 2 a. Define the types of data dependence. Also compute the dependence graph for the following code segment  
 $S_1$  : Load  $R_1$ , A  
 $S_2$  : ADD  $R_2$ ,  $R_1$   
 $S_3$  : MOVE  $R_1$ ,  $R_3$   
 $S_4$  : Store B,  $R_1$  (10 Marks)  
 b. Explain the characteristics of the following static connection networks with diagram:  
 (i) Linear array  
 (ii) Chordal ring of degree 4  
 (iii) Binary tree  
 (iv) Mesh  
 (v) Torus (10 Marks)

**Module-2**

- 3 a. Distinguish between RISC and CISC processor architectures with block diagram. (10 Marks)  
 b. Explain VLIW processor architecture and its pipeline operations. (10 Marks)

**OR**

- 4 a. Explain in detail inclusion, coherence and locality properties. (10 Marks)  
 b. Illustrate the four level memory hierarchy. (04 Marks)  
 c. Define the various page replacement policies. (06 Marks)

**Module-3**

- 5 a. What is arbitration? Describe central arbitration and distributed arbitration with relevant sketches. (10 Marks)  
 b. Discuss physical address models and virtual address models for unified and split caches. (10 Marks)

**OR**

- 6 a. Explain two-models of linear pipeline units and the corresponding reservation table. (05 Marks)  
 b. Explain the features of non-linear pipeline processor with feed forward and feed backward connections. (05 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
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- c. Consider the following pipeline reservation table:

		Time →							
		1	2	3	4	5	6	7	8
Stages	S <sub>1</sub>	X					X		X
	S <sub>2</sub>		X		X				
	S <sub>3</sub>			X		X		X	

- (i) What are the forbidden latencies?
- (ii) What is the initial collision vector?
- (iii) Draw the state transition diagram.
- (iv) List all the simple cycles.
- (v) List all the greedy cycles.

(10 Marks)

**Module-4**

- 7 a. With a neat diagram, explain the bus systems at board level, backplane and I/O level. (10 Marks)
- b. Define the two approaches of snoopy bus cache coherence protocol. Also write the state transition graphs for write through and write back cache. (10 Marks)

**OR**

- 8 a. Explain the flow control methods for resolving a collision between two packets requesting the same outgoing channel. (10 Marks)
- b. Explain vector-access memory schemes with neat diagrams. (10 Marks)

**Module-5**

- 9 a. Describe language features for parallelism. (10 Marks)
- b. Describe the compilation phases in parallel code generation. (10 Marks)

**OR**

- 10 a. Describe in brief the structure of the reorder buffer and how the use of reorder buffer addresses the various types of dependencies in the program. (10 Marks)
- b. With the help of a block diagram, explain the role of reservation stations used in Tomasulo's algorithm. (10 Marks)

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## Seventh Semester B.E. Degree Examination, July/August 2022 Natural Language Processing

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. What is NLP? List and explain applications of NLP. (10 Marks)  
b. Briefly explain various levels of natural language processing. (10 Marks)

OR

- 2 a. Describe C-structure and F-structure in LFG. Write C-structure and F-structure for the sentence 'She saw stars' using the CFG rules as below.  
 $S \rightarrow NP VP$   
 $VP \rightarrow V\{NP\}\{NP\}PP^*\{S'\}$   
 $PP \rightarrow PNP$   
 $NP \rightarrow Det N\{PP\}$   
 $S' \rightarrow Comps$  (10 Marks)  
b. Describe Paninian Framework for Indian languages. Explain Layered representation of Paninian Grammar and Karaka theory. (10 Marks)

### Module-2

- 3 a. Describe DFA and NFA. Mention the properties of Finite automation. (06 Marks)  
b. Define Morphology. Explain stem and affix classes of Morphemes with example. (04 Marks)  
c. Explain two step morphological parser with a neat diagram. (10 Marks)

OR

- 4 a. Write minimum Edit Distance Algorithm. (05 Marks)  
b. What is POS tagging? Explain Rule based Tagger and Hybrid Taggers. (10 Marks)  
c. Write CYK syntactic parsing algorithm. (05 Marks)

### Module-3

- 5 a. Explain two major approaches of relation extraction. (05 Marks)  
b. Describe the patterns used to extract relationship between two entity with a given sentence. (05 Marks)  
c. Write short notes on the following:  
(i) Globalsecurity.org  
(ii) InFact system (10 Marks)

OR

- 6 a. Explain Active Learning Strategy steps for acquiring labels from a human annotator. (07 Marks)  
b. What are the different steps used to achieve the goal of case annotation? (07 Marks)  
c. Briefly describe the following :  
(i) Domain knowledge.  
(ii) Domain concept  
(iii) Knowledge Roles. (06 Marks)

**Module-4**

- 7 a. What is iSTART? List the reading strategies used by iSTART. (06 Marks)  
 b. Explain Literal word matching and soundex word matching approaches. (06 Marks)  
 c. Briefly describe LSA feedback systems. Mention four benchmarks used by LSA to Assess the level of an explanation. (08 Marks)

**OR**

- 8 a. Briefly describe the evolutionary model for knowledge discovery from texts with a neat diagram. (10 Marks)  
 b. Describe the following: (10 Marks)  
 (i) Topic models  
 (ii) Cohesion and Cohesion matrix.

**Module-5**

- 9 a. Explain basic information Retrieval process with a neat diagram. (06 Marks)  
 b. Describe the following approaches used in I.R. : (09 Marks)  
 (i) Indexing.  
 (ii) Stop words elimination.  
 (iii) Stemming.  
 c. State and explain the importance of Zipf law related to words distribution in NLP. (05 Marks)

**OR**

- 10 a. Explain the following alternative IR models: (10 Marks)  
 (i) Cluster model.  
 (ii) Fuzzy model.  
 b. Describe cosine and Jaccard Similarity measures used for IR. (06 Marks)  
 c. Describe tf-idf term weightage approach used in IR. (04 Marks)

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## Seventh Semester B.E. Degree Examination, July/August 2022

### Python Application Programming

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

#### Module-1

- 1 a. List and explain the salient features of Python. (05 Marks)  
b. Explain the Computer hardware architecture with a neat diagram. (10 Marks)  
c. Write a Python program that prompts the user for a Celsius temperature, convert the temperature to Fahrenheit and print out the converted temperature. (05 Marks)

#### OR

- 2 a. Write a Python program to find largest of three numbers. (06 Marks)  
b. Write a python program to prompt the user for a number to find the following :  
i) a number is even or odd ii) a number is positive or negative. (06 Marks)  
c. Explain the syntax of user defined functions in python. Write a user defined function to find sum of three numbers. (08 Marks)

#### Module-2

- 3 a. Give the syntax and flow chart of while loop. (06 Marks)  
b. Write a python program to check whether the given number is palindrome or not. (08 Marks)  
c. For given string S = 'PYTHON', find the output for the following :  
i) S[0 : len(s)] ii) S[:] iii) S[0 : 3]  
iv) S[-4 : -1] v) S[-4 : ] vi) S[-4 : 4]. (06 Marks)

#### OR

- 4 a. Discuss the read mode and write mode on files. Write a python program to read and write to a file. (10 Marks)  
b. Write a python program to count number of lines in the given file. (06 Marks)  
c. List and explain any four methods associated with strings. (04 Marks)

#### Module-3

- 5 a. Define List. Write a python program for the following : i) Accessing list elements  
ii) Adding new values to list iii) Deleting list element. (12 Marks)  
b. Define Dictionary. Discuss any four operations associated with dictionaries. (08 Marks)

#### OR

- 6 a. Discuss how to create a tuple and compare tuple elements with an example. (08 Marks)  
b. Demonstrate how to use tuples as keys in dictionaries. (06 Marks)  
c. Write a python program that uses regular expression to search for lines that start with From and have an at sign. (06 Marks)

#### Module-4

- 7 a. How classes and attributes in python are associated? Give examples. (06 Marks)  
b. Discuss Pure functions and Modifiers with an example. (08 Marks)  
c. Are objects are mutable? Justify. (06 Marks)

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OR

- 8 a. Write a function called `print_line` that takes a time object and prints it in the form of  
hour : minute : second. (06 Marks)
- b. Discuss Operator overloading with a suitable example. (06 Marks)
- c. Demonstrate the concept of inheritance with a class diagram. (08 Marks)

**Module-5**

- 9 a. Define Protocol. Write a python program that makes a connection to a web server and follows the rules of HTTP protocol to request a plain text document and display what server sends back. (10 Marks)
- b. Define XML. Write a python code for passing and extracting data elements from the XML. (10 Marks)

OR

- 10 a. What is Service – Oriented Architecture? List out the advantages of SOA. (06 Marks)
- b. Discuss various keys available in a database model. (06 Marks)
- c. Discuss the four basic SQL commands needed to create and maintain data. (08 Marks)

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## Seventh Semester B.E. Degree Examination, July/August 2022 Introduction to Artificial Intelligence

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Define AI. Explain its applications with its advantages and disadvantages. (10 Marks)  
b. Discuss the classification of AI tests with an illustration. (10 Marks)

OR

- 2 a. Define problem state space. Explain the problem characteristics of state space. (10 Marks)  
b. Explain Steepest Assent Hill Climbing with advantages and disadvantages. (10 Marks)

### Module-2

- 3 a. Illustrate and explain Mapping representation between Fact and knowledge with approaches. (05 Marks)  
b. Discuss property (algorithm) of inheritance with an example. (10 Marks)  
c. Write predicate logic for the following  
i) Every men and women are humans who have two legs.  
ii) All animals have skin and can move  
iii) All romans were either loyal to caeser or hated him.  
iv) Everyone is loyal to someone  
v) Rajive likes cricket. (05 Marks)

OR

- 4 a. Discuss classification algorithm. (10 Marks)  
b. Discuss the resolution algorithm. (10 Marks)

### Module-3

- 5 a. Discuss the logic for monotonic reasoning and non-monotonic reasoning with an example. (10 Marks)  
b. Discuss symbolic reasoning under uncertainty and issues addressed. (10 Marks)

OR

- 6 a. Explain Baye's network algorithm with its advantages. (10 Marks)  
b. Discuss the algorithm of Dempster Shafer with an example. Discuss certainty factors. (10 Marks)

### Module-4

- 7 a. Explain Min-max algorithm with its limitation and basic rules. (10 Marks)  
b. Discuss the algorithm for iterative deepening A\* with an illustration explain  $\alpha - \beta$  pruning algorithm. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.



OR

- 8 a. Discuss the steps/phases of natural language processing with the advantages and disadvantages. (10 Marks)
- b. Discuss semantic analysis with an example. (06 Marks)
- c. Explain the classification of spell check techniques. (04 Marks)

Module-5

- 9 a. Discuss the techniques used for constructing class definition by induction method. Also explain the Winston's learning program step and block world concept with an illustration for structures of the houses with near misses. (10 Marks)
- b. Explain analogy based learning with an illustration and example. (10 Marks)

OR

- 10 a. Explain major expert system components with a neat sketch. (05 Marks)
- b. Explain problem areas and benefit expert system. (10 Marks)
- c. With an illustration, explain Rapid prototyping of intelligent system development. (05 Marks)

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