

CBCS SCHEME

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18CS71

Seventh Semester B.E. Degree Examination, Feb./Mar. 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. List all task domains of Artificial Intelligence. (06 Marks)
- b. Explain Minimax procedure of tic – tac – toe. (07 Marks)
- c. List all production rules for the water jug problem. (07 Marks)

OR

- 2 a. Illustrate Slot – and – filler structure method in Question and Answering system. (06 Marks)
- b. Explain Hill climbing issues which terminates algorithm without finding a goal state or getting to a state from which no better state can be generated. (04 Marks)
- c. Apply AO* algorithm for the following graph and find final path. (10 Marks)

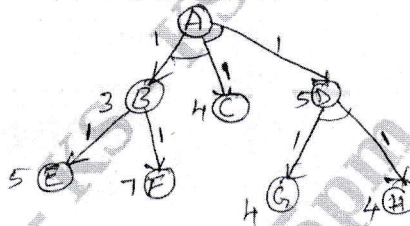


Fig. Q2(c)

Module-2

- 3 a. Convert the following statement into its Equivalent Predicate Logic from
 - i) Marcus was a man
 - ii) Marcus was a Pompeian
 - iii) All Pompeians were Romans
 - iv) Caesar was a Ruler
 - v) All Romans were either loyal to Caesar or hated him.
 - vi) Everyone is loyal to someone
 - vii) People only try to assassinate rulers they are not loyal to.
 - viii) Marcus tried to assassinate Caesar.(08 Marks)
- b. List the issues on Knowledge representation. (05 Marks)
- c. Construct maximally specific hypothesis for the following training examples. (07 Marks)

Example	Sky	Air Temp	Humidity	Wind	Water	Forecast	Enjoy Sport
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

OR

- 4 a. Apply Candidate Elimination algorithm for the dataset given above (Question 3(c)). How do you classify following new instance from the set of hypothesis obtained by Candidate Elimination algorithm? (12 Marks)

Instance	Sky	Air Temp	Humidity	Wind	Water	Forecast	Enjoy Sport
A	Sunny	Warm	Normal	Strong	Cool	Change	?
B	Rainy	Cold	Normal	High	Warm	Same	?

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- b. What are Horn Clauses? Write a declarative and a procedural representation. List syntactic difference between Logic and PROLOG. (08 Marks)

Module-3

- 5 a. Construct decision tree using ID3 algorithm for the following data : (12 Marks)

Day	Outlook	Temp	Humidity	Wind	Decision
1	Sunny	Hot	High	Weak	Yes
2	Sunny	Hot	High	Strong	No
3	Overcast	Hot	High	Weak	Yes
4	Rain	Mild	High	Weak	No
5	Rain	Cool	Normal	Weak	Yes

- b. Derive Gradient descent rule. (08 Marks)

OR

- 6 a. Give decision tree to represent the following Boolean functions :

i) $A \wedge \neg B$ ii) $A \vee [B \wedge C]$ iii) $A \text{ XOR } B$ iv) $[A \wedge B] \vee [C \wedge D]$.

(08 Marks)

- b. Explain Perceptron with appropriate diagram Represent AND Boolean function using Perceptron. (04 Marks)
- c. Write Back propagation algorithm. (08 Marks)

Module-4

- 7 a. A patient takes a lab test and the result comes back positive. The test returns a correct positive result in only 98% of the cases in which the disease is actually present and a correct negative result in only 97% of the cases in which the disease is not present. Further, 0.008 of the entire population have the Cancer. Does a patient have Cancer or not? (10 Marks)
- b. Derive Brute force MAP learning and also mention assumption made in this process. (10 Marks)

OR

- 8 a. Explain Minimum Description Length Principle (MDL). (06 Marks)
- b. Explain Naïve Bayes classifier and Bayesian belief Networks. (08 Marks)
- c. Write EM algorithm. (06 Marks)

Module-5

- 9 a. Explain K – NN algorithm. (06 Marks)
- b. Explain steps of Locally Weighted Linear regression. (07 Marks)
- c. Describe Radial basis function with appropriate diagram. (07 Marks)

OR

- 10 a. Illustrate the basic concept of Q – learning using Simple Deterministic World. (10 Marks)
- b. Explain Q – Learning algorithm. (10 Marks)

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Seventh Semester B.E. Degree Examination, Feb./Mar.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. Discuss the Evolution of Big Data. (06 Marks)
b. Explain the characteristics of Big Data. (04 Marks)
c. With a neat block diagram, explain Data Architecture Design. (10 Marks)

OR

- 2 a. Write notes on Analytics Scalability to Big Data and Massive Parallel Processing Platforms. (12 Marks)
b. Highlight Big Data Analytics applications with one case study. (08 Marks)

Module-2

- 3 a. What are the core components of Hadoop? Explain in brief its each of its components. (10 Marks)
b. Explain Hadoop Distributed File System. (10 Marks)

OR

- 4 a. Define MapReduce Frame work and its functions. (06 Marks)
b. Write down the steps on the request to MapReduce and the types of process in MapReduce. (10 Marks)
c. Write short notes on Flume Hadoop Tool. (04 Marks)

Module-3

- 5 a. Discuss the characteristics of NoSQL data store along with the features in NoSQL transactions. (08 Marks)
b. With neat diagrams, explain the following for shared-Nothing Architecture for Big Data Tasks,
(i) Single Server model
(ii) Sharding very large databases
(iii) Master Slave distribution model.
(iv) Peer-to-Peer distribution model. (12 Marks)

OR

- 6 a. Define key-value store with example! What are the advantages of key-value store? (10 Marks)
b. Write down the steps to provide client to read and write values using key-value store. What are the typical uses of key value store? (10 Marks)

Module-4

- 7 a. With a neat diagram, explain the process in MapReduce when client submitting a Job. (10 Marks)
b. Explain Hive Integration and work flow steps involved with a diagram. (10 Marks)

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OR

- 8 a. Using HiveQL for the following:
(i) Create a table with partition. (10 Marks)
(ii) Add, rename and drop a partition to a table. (10 Marks)
- b. What is PIG in Big Data? Explain the features of PIG. (10 Marks)

Module-5

- 9 a. In Machine Learning explain linear and non-linear relationship with essential graphs. (10 Marks)
- b. Write the block diagram of text mining process and explain its phases. (10 Marks)

OR

- 10 a. Define multiple regressions. Write down the examples involved in forecasting and optimization in regression. (10 Marks)
- b. Explain the parameters in social graph network topological analysis using centralities and PageRank. (10 Marks)

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18CS733

Seventh Semester B.E. Degree Examination, Feb./Mar. 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 Flynn's classification of computer architecture based on instruction stream and data stream. (06 Marks)
- b. Explain in detail the types of shared memory multiprocessors. (08 Marks)
- c. A 400 MHz processor was used to execute a bench mark program with the following instruction mix and clock cycle counts:

Instruction Type	Instruction count	Clock Cycle Count
Integer Arithmetic	450000	1
Data Transfer	320000	2
Floating Point	150000	2
Control Transfer	80000	2

Determine the effective CPI, MIPS, rate and execution time for the program. (06 Marks)

OR

- 2 a. Compare and contrast control flow and data flow architectures. (08 Marks)
- b. Perform a data dependence analysis on each of the following Fortran program fragments. Show the data dependency and resource dependency graphs among the statements.

a)	S1: A = B + D	b)	S1 : X = sin (X)
	S2: C = A * 3		S2: X + W
	S3: A = A + C		S3: Y = 2 *W
	S4: E = A/2		S4: X = cos (Z)

- c. What are the metrics affecting the scalability of a computer system? Explain. (06 Marks)

Module-2

- 3 a. Apply the knowledge of memory hierarchy and explain the properties that every information stored in a memory hierarchy should satisfy. (10 Marks)
- b. With the knowledge of three level memory hierarchy, consider the following specifications:

Memory level	Access Time	Capacity	Cost/Kbyte
Cache	$t_1 = 25 \text{ ns}$	$S_1 = 512 \text{ kb}$	$C_1 = \$0.12$
Main memory	$t_2 = \text{unknown}$	$S_2 = 32 \text{ mb}$	$C_2 = \$0.02$
Disk array	$t_3 = 4 \text{ ms}$	$S_3 = \text{unknown}$	$C_3 = \$0.00002$

The design goal is to achieve an effective memory access time $t = 850 \text{ ms}$ with a cache hit ratio $h_1 = 0.98$ and a hit ratio $h_2 = 0.99$ in main memory. Calculate the memory access time t_2 of the RAM to build main memory. Total cost of the memory hierarchy is \$1,500. Find S_3 . (04 Marks)

- c. Compare and contrast the different instruction set architectures. (06 Marks)

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OR

- 4 a. Branch out the schemes used for translating virtual address into physical address. (08 Marks)
- b. Make use of the following page trace 0 1 2 4 2 3 7 2 1 3 1. Calculate the hit ratio for the following page replacement policies where page frame = 3.
- FIFO
 - LRU
 - OFTIMAL
- (06 Marks)
- c. Explain the concept of virtual memory models with a neat diagram. (06 Marks)

Module-3

- 5 a. Compare the relative merits and demerits of the following cache memory organization techniques:
- Direct mapping cache
 - Fully associative cache
 - Set Associative cache
 - Sector mapping cache
- (10 Marks)
- b. Consider the execution of a program of 15,00,000 instructions by a linear pipeline processor with a clock rate of 1000 MHz. Assume that the instruction pipeline has five stages and that one instruction is issued per clock cycle. The penalties due to branch instructions and out-of-sequence executions are ignored.
- Calculate the speed-up factor in using this pipeline to execute the program as compared with the use of an equivalent non-pipelined processor with an equal amount of flow-through delay.
 - What are the efficiency and throughput of this pipelined processor? (06 Marks)
- c. Apply the knowledge of dynamic instruction scheduling and explain Tomosulo's algorithm with an example. (04 Marks)

OR

- 6 a. Analyze and compare the ways to close-up the speed gap between CPU/cache and main memory. (06 Marks)
- b. Consider the following reservation table for a three stage pipeline with a clock rate $\tau = 2\text{ns}$.

	1	2	3	4	5	6	7	8
S ₁	X					X		X
S ₂		X		X				
S ₃			X		X		X	

- What are the forbidden latencies and the initial collision vector?
 - Draw the state transition diagram for scheduling the pipeline.
 - List all the simple cycles and greedy cycles.
 - Determine the minimal average latency.
 - Determine the throughput of this pipeline. (10 Marks)
- c. Explain any two bus arbitration techniques. (04 Marks)

Module-4

- 7 a. Design an Omega network and check whether the routing is permissible or blocked for the given permutation $\pi_1 = (0, 7, 6, 4, 2) (1, 3) (5)$ and $\pi_2 = (0, 6, 4, 7, 3) (1, 5) (2)$. (10 Marks)
- b. Apply the knowledge of cache coherence problems and design a directory based protocol to maintain data consistency. (10 Marks)

OR

- 8 a. Illustrate three vector schemes used for the flow of vector operands between the main memory and vector registers by allowing parallel memory accesses. (06 Marks)
- b. Design a rule for a supercomputer to solve a large scale scientific and engineering problems by providing highest performance constrained by current technology. (06 Marks)
- c. Explain in detail the snoopy bus protocol. (08 Marks)

Module-5

- 9 a. List and explain any five language features which set the guidelines for developing a user friendly programming environment. (06 Marks)
- b. Apply the knowledge of parallel programming and design a subscript partitioning algorithm for representing dependencies between an arbitrary pair of subscripted references to the same array variable. (08 Marks)
- c. Mention branch prediction methods and explain. (06 Marks)

OR

- 10 a. With the knowledge of abstraction with respect to program and computer hardware/software systems, explain various programming models. (10 Marks)
- b. Explain the basic compiler techniques used to achieve instruction level parallelism. (05 Marks)
- c. Interpret the knowledge of Tomasulo's algorithm to eradicate RAW dependency in any programming language constructs. (05 Marks)

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Seventh Semester B.E. Degree Examination, Feb./Mar. 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. Define NLP. What makes NLP difficult. (10 Marks)
b. Explain Karaka theory of Paninian grammar. Identify different Karaka's in the following sentence in Hindi language. "Maan bachchi ko aangan mein haath se rotii khilaatii hei". (10 Marks)

OR

- 2 a. Explain transformational grammar with example. (10 Marks)
b. Write the C-structure and F-structure for the following sentence "she saw stars". Consider the CFG rule.
 $S \rightarrow NPVP$
 $VP \rightarrow V \{NP\} \{NP\} PP^* \{S'\}$
 $PP \rightarrow P NP$
 $NP \rightarrow Det N \{PP\}$
 $S' \rightarrow comp S$ (10 Marks)

Module-2

- 3 a. What is morphological passing? Explain 2-level morphological model with an example. (10 Marks)
b. Write and explain an algorithm for minimum edit distance spelling correction. Apply the same to find the minimum edit distance between words 'PEACEFUL' and 'PAECFLU'. (10 Marks)

OR

- 4 a. Explain Levensthein minimum edit distance algorithm. (10 Marks)
b. Write a note on different phrase level constructs with suitable example for each phrase. (10 Marks)

Module-3

- 5 a. With neat diagram, explain the infact framework architecture over view. (10 Marks)
b. Write a neat diagram, explain the architecture used in the task of learning to annotate cases with knowledge roles. (10 Marks)

OR

- 6 a. Explain the strategies used in active learning approach for acquiring labels using committee based classification scheme. (10 Marks)
b. Write a short note on:
i) The shortest path hypothesis
ii) Learning with dependency path. (10 Marks)

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Module-4

7. a. Explain SVM (Support Vector Machine) learning method in sequence model estimation. (10 Marks)
b. Explain in detail the high-level representation approaches in text mining. (10 Marks)

OR

8. a. Explain the functioning of word matching feedback system used in ISTART. (10 Marks)
b. Write a note on various approaches to analyzing texts. (10 Marks)

Module-5

9. a. Explain design feature of IR with a neat diagram. (10 Marks)
b. Explain classical information retrieval models. (10 Marks)

OR

10. a. With a suitable example explain cluster based Information Retrieval (IR) modeling. (10 Marks)
b. Write short note on: i) Word Net , ii) Frame Net. (10 Marks)

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18CS752

Seventh Semester B.E. Degree Examination, Feb./Mar. 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 the features of Python Programming Language. (04 Marks)
- b. How Python handles exceptions? Explain with programming example. (08 Marks)
- c. Write a Python program to find the largest of three numbers. (08 Marks)

OR

- 2 a. Explain the Chained and Nested conditional execution statement along with syntax and flow chart. (08 Marks)
- b. Explain with example, Fruitful and Non – fruitful functions in Python. (06 Marks)
- c. Demonstrate the use of break and continue keyword using a Snippet of code. (06 Marks)

Module-2

- 3 a. Explain Definite and Indefinite loops in Python with example. (06 Marks)
- b. What are String Slices? Explain the Slicing Operator in Python with example. (06 Marks)
- c. Write a Python program to count the frequency of occurrence of character within another string. (08 Marks)

OR

- 4 a. List and explain four built – in string manipulation functions supported by Python. (08 Marks)
- b. Explain with examples read () and write () methods in file. (06 Marks)
- c. Write a Python program to generate and print prime numbers in a given range. (06 Marks)

Module-3

- 5 a. What are Lists? Explain any four. List methods with examples. (06 Marks)
- b. How tuples are created in Python? Explain different ways of creating and accessing them. (06 Marks)
- c. Write a Python program to count the frequency of each of the word in a given file. (08 Marks)

OR

- 6 a. Explain Dictionaries in Python with examples. (08 Marks)
- b. Explain the need of regular expressions in Python with example. (06 Marks)
- c. Implement a Python program using Lists to store and display the average of 'N' integers accepted from the user. (06 Marks)

Module-4

- 7 a. What is a Class? Explain how class and object are created in Python. (06 Marks)
- b. With example, explain Shallow copy and Deep copy methods in class. (06 Marks)
- c. Write a program to add two point objects by overloading + operator. Overload __str__ () to display point as a ordered pair. (08 Marks)

OR

1 of 2

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- 8 a. Explain `__init__()` method with example. (08 Marks)
b. Explain Pure functions and Modifiers with example. (08 Marks)
c. Explain type based dispatch with an example. (04 Marks)

Module-5

- 9 a. What is Socket? Explain how Socket connection can be established over TCP/IP connection and retrieve the data from a web page. (08 Marks)
b. Explain the significance of XML over the web development. Illustrate with an example. (06 Marks)
c. Write a program to retrieve data from a webpage using `urllib` and to count the number of words in it. (06 Marks)

OR

- 10 a. What is JSON? Illustrate the concept of parsing JSON Python code. (06 Marks)
b. Define Cursor. Explain `connect`, `execute` and `close` commands of databases with a suitable example. (08 Marks)
c. Write a program to extract various parts of anchor tag using BeautifulSoup. (06 Marks)

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18CS753

Seventh Semester B.E. Degree Examination, Feb./Mar.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. What do you mean by an Artificial Intelligence techniques? (05 Marks)
- b. Demonstrate the turing test with example. (07 Marks)
- c. Write short notes on problem area in Artificial Intelligence. (08 Marks)

OR

- 2 a. Solve the cryptarithmic problem given below with proper steps.
POINT
+ZERO

ENERGY. (05 Marks)
- b. Explain the four categories of production systems with an example for each. (07 Marks)
- c. Explain the decomposable and non-decomposable problem with an example. (08 Marks)

Module-2

- 3 a. Differentiate between forward reasoning and backward reasoning. (05 Marks)
- b. Explain the convert to clause form algorithm with an example. (07 Marks)
- c. Consider the following sentences:
 - John likes all kinds of food.
 - Apples are food.
 - Chicken is food.
 - Anything any one eats and is not killed by is food.
 - Bill eats peanuts and still alive.
 - Sue eats everything bill eats(i) Convert these into predicate logic. (08 Marks)
- (ii) Prove that "John likes peanuts" using back chaining. (08 Marks)

OR

- 4 a. Write the four properties of knowledge representation system. (05 Marks)
- b. Discuss various issues in knowledge representation. (07 Marks)
- c. Consider the following facts:
 - Marcus was a man.
 - Marcus was a Pompeian.
 - All pompeians were Romans.
 - Caesar was a ruler.
 - All romans were either loyal to caesar or hated him.
 - Everyone loyal to someone.
 - People only try to assassinate rulers they are not loyal to.
 - Marcus try to assassinate ceaser.(i) Prove that marcus is not loyal to ceaser by backward substitution. (08 Marks)
- (ii) Represent the above statements using instance relationship and ISA relationship. (08 Marks)

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Module-3

- 5 a. What is Non-Monotonic reasoning? (05 Marks)
 b. Explain default reasoning and minimalist reasoning. (10 Marks)
 c. Explain closed world assumptions. (05 Marks)

OR

- 6 a. Define the Bayes theorem. (05 Marks)
 b. Explain JTMS and dependency directed backtracking. (10 Marks)
 c. Explain Bayesian networks with a diagram. (05 Marks)

Module-4

- 7 a. Explain the steps involved in natural language processing. (08 Marks)
 b. Explain the minmax search with an example. (08 Marks)
 c. Write an interactive deepening A* algorithm. (04 Marks)

OR

- 8 a. What is conceptual parsing? (05 Marks)
 b. Write a short notes on Alpha-beta cutoffs. (08 Marks)
 c. Derive the parse tree for the following sentence making use of appropriate grammar:
 "Bill printed the file". (07 Marks)

Module-5

- 9 a. What is the role of expert system and knowledge acquisition? (05 Marks)
 b. Write a note on explanation-based learning and explain rote learning with an example. (10 Marks)
 c. Discuss the concept of learning from taking advice. (05 Marks)

OR

- 10 a. What do you mean by expert shell? (05 Marks)
 b. Explain Winston's learning program in detail. (10 Marks)
 c. Discuss the concept of learning by chunking. (05 Marks)
