

# END TERM EXAMINATION

THIRD SEMESTER [B.TECH] JANUARY 2024

Paper Code: AIML/IIOT/AIDS-201

Subject: Data Structures

Time: 3 Hours

Maximum Marks: 75

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit. Assume missing data if any.

Q1 Attempt all questions:

- i) 2 What is Data Structures? Why do we need data structures? In (3) how many ways can you classified the data structures?
- ii) 2 Explain features of list, set, tuples, and dictionary data (3) structures.
- iii) 3 Given a sorted list of numbers {1,13,19,25,38,55,70,80}. Search (3) for value 70 using Binary Search Algorithm.
- iv) 3 Explain threaded binary tree? (3)
- v) 3 Explain Topological sort with the help of example. (3)

### UNIT-I

- Q2 a) Write an algorithm/function to convert the infix expression into (7) prefix expression using stack. Using the above algorithm convert the following infix expression into prefix using stack.  
P\*O/R+(S-T\*U)
- b) What is Circular Queue? Why Circular Queue better than Linear (8) Queue? Write an algorithm/function for enqueue and dequeue operations on Circular Queue?

### OR

- Q3 a) What is an array? How multidimensional array are stored in (5) memory? Consider a 2-D float array A [5:10][6:10] is stored in row -wise form in the memory. Suppose the base address of an array A is 800.
  - i) Find the total number of elements in an array A.
  - ii) Find the address of A[7][7]
- b) Write a function/algorithm to evaluate the postfix expression (5) using stacks? Using above algorithm evaluate the following expression: 3,4,5,6,\*,+,7,-,/  
c) What is Deque? Write an algorithm for deletion at rear end in a (5) Deque?

### UNIT-II

- Q4 a) What is linked list? Explain advantages and disadvantages of (8) linked list over an array? Write an algorithm/function to insert an element at the end of the linear linked list.
- b) Write an algorithm/function for Quick Sort. Perform quick sort (7) on the following values. Assume 48 as Pivot point.  
48, 37, 12, 78, 19, 50, 22, 60

P.T.O.

- Q5 a) What is doubly linked list? Write a program to create a doubly linked list having information about a student such as name, roll no, marks etc. and perform insertion and deletion of a node from the beginning. **(8)**
- b) Write an algorithm for Radix Sort. Perform the radix sort on the following values.  
380, 489, 567, 235, 323, 755, 155 **(7)**

**UNIT-III**

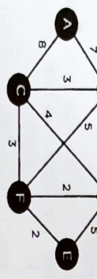
- Q6 a) What is B-tree? Compare B-tree with B+ trees. Construct B-tree of order 5 by inserting the following elements in the order of their occurrence.  
M, T, E, O, K, C, G, N, H, U, W, **(8)**
- b) The pre-order and in-order traversal of a binary tree are given below. Construct corresponding binary tree. Write its equivalent post-order traversal. Write a recursive algorithm/ function for post-order traversal.  
Pre-order: A, B, D, C, E, G, F, H, I  
In-order: D, B, A, E, G, C, H, F, I **(7)**

**OR**

- Q7 a) What is Binary Search tree? Construct a Binary Search tree for the following data in sequence 77,33,44,11,22,55,66. Write its equivalent in-order traversal. **(7)**
- b) What kind of the Binary Search Tree is created in section (i)? Is there any associated problem with such kind of Binary Search Tree? If yes, provide the detail solution. **(8)**

**UNIT-IV**

- Q8 a) What is minimum spanning tree? Find the minimum spanning tree for the given graph using Prim's algorithm. **(7)**



- b) Explain the following collision resolution method with the help of example:  
a) Linear Probing  
b) Double hashing  
c) Quadratic probing  
d) Chaining **(8)**

**P.T.O.**

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P-2/a

- Q9 a) Write an algorithm for Depth First Search. Traverse the given graph using DFS. Assume vertex 1 as starting vertex. **(6)**



- b) Explain briefly about the following file organization:  
a) Sequential access file organization  
b) Direct access file organization  
c) Indexed Sequential access file organization **(9)**

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P-2/a

# END TERM EXAMINATION

THIRD SEMESTER [B.TECH] JANUARY 2024

Paper Code: AIDS/AIML/ IOT -203

Subject: Foundations of Data Science

Time: 3 Hours

Maximum Marks: 75

Note: Attempt five questions in all including Q. No.1 which is compulsory. Internal choice is indicated.

- Q1 Attempt all questions:-
- (a) Difference between data Analysis and analytics? (3)
  - (b) Explain supervised and unsupervised machine Learning? (3)
  - (c) What is data cleaning? Write the syntax to remove duplicate observations from a data frame in python? (3)
  - (d) Which are the best libraries for data visualization in python? Define IQR in a box plot. (3)
  - (e) How is np.mean() different from np.average() in NumPy? (3)
- Q2
- (i) Briefly explain the different steps of Data Science Process.
  - (ii) Why synthetic dataset generation needed? Give different commands in python for creating dataset.
  - (iii) Explain the process of data pre-processing. (15)
- Q3 Explain Jobroles of the following. (15)
- (i) Data Scientist.
  - (ii) Data Analyst
  - (iii) Machine learning expert.
  - (iv) Data engineer
  - (v) Data Architect
  - (vi) Data Administrator
  - (vii) Business Analyst.
  - (viii) Business Intelligence
- Q4
- (i) Explain in detail about data cleaning, integrating and transforming data in Data Science Process.
  - (ii) What do you mean by slicing operation in string of python? Write and example of slicing to fetch first name and last name from full name of a person and display it. (15)
- Q5 Write a python program to read a file. Illustrate the flow of the program. (15)
- Q6 Summarize the characteristics of NumPy, Pandas, SciPy and matplotlib libraries along with their usage in brief. Also, explain the typical methods to visualize data. (15)
- Q7 Write Python program that counts the words in its input and returns the most common ones. Also, Explain about Data frames. (15)
- Q8
- (i) Show the ways in which decision making and predictions are made in Data Science. Name some of the scientific methods used in data science.
  - (ii) Explain how a manufacturing industry using data science. (15)
- Q9 What is Recommender system? How you create a recommender system in python? Give and explain a real time example of recommender system. (15)

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# END TERM EXAMINATION

THIRD SEMESTER [B. TECH] JANUARY 2024

Paper Code: AIDS/AIIML/IOT/205 Subject: Digital Logic Design  
 Time: 3 Hours Maximum Marks: 75

Note: Attempt five questions in all including Q.No. 1 which is compulsory. Assume missing data if any. Select one question from each unit.

- Q1 a) Which gates are called Universal Gates? Give reasons for your answer. [3]  
 b) Explain the difference between prime implicants and essential prime implicants with example. [3]  
 c) Mention differences between Combinational and Sequential Circuits. [3]  
 d) What are the differences between PROM, PAL, and PLA? [3]  
 e) What do you understand by D/A converter and A/D converter? [3]

UNIT-I

- Q2 a) Perform  $(7129)_{10} + (7711)_{10}$  using BCD arithmetic. [4]  
 b) Using Boolean laws and postulates, convert the expression  $F = (AB + C)(B + C'D)$  into SOP and POS. [5]  
 c) Convert the following numbers: [6]  
 (i)  $(110010)_2 = (\quad)_{16}$  (ii)  $(658.825)_{10} = (\quad)_8$
- OR
- Q3 a) Perform the subtraction on the given unsigned binary numbers using the 2's complement of the subtrahend:  $1001 - 110101$  [4]  
 b) Reduce the following Boolean expressions to the indicated number of literals: [5]  
 (i)  $ABCD + A'BD + ABC'D$  to two literals  
 (ii)  $AC' + ABC + AC'$  to three literals

- c) Convert the following numbers: [6]  
 (i)  $(110.010)_2 = (\quad)_{16}$  (ii)  $(FAFA.B)_{16} = (\quad)_{10}$

UNIT-II

- Q4 a) Design the circuit of the given Boolean expression by using NAND gates [4]  
 only,  $F = ABC' + DE + AB'D'$   
 b) Simplify the Boolean function using 3-variable map and draw the logic diagram:  $F(x,y,z) = \sum(0,2,4,5,6)$  [5]  
 c) Reduce the Boolean expression using K-map: [6]  
 $F(A,B,C,D) = \prod M(0,2,7,8,9,10,11,15) + d(3,4)$

OR

- Q5 a) Design the circuit of the given Boolean expression by using NOR gates [4]  
 only,  $F = [(A + B)(A' + C)(B + D)']$   
 b) Simplify the Boolean function using 3-variable map and draw the logic diagram:  $F(x,y,z) = \sum(2,3,6,7)$  [5]  
 c) Reduce the Boolean expression using K-map: [6]  
 $F(A,B,C,D) = \sum m(4,5,7,12,14,15) + d(3,8,10)$

P.T.O.

UNIT-III

- Q6 a) Design and explain the Half-adder [4]  
 b) What do you understand by Decoder? Mention its applications. [5]  
 c) Design a four-bit adder-subtractor circuit and explain the operation in detail. [6]
- OR
- Q7 a) What are the differences between static and dynamic RAM? [4]  
 b) What do you understand by Multiplexer? Mention its applications. [5]  
 c) Design four-input priority encoder with the help of truth table and K-map. [6]

UNIT-IV

- Q8 a) Differentiate between Flip-Flops and Latches. [4]  
 b) Draw the logic circuit of D-flip flop using SR-flip flop. [5]  
 c) What do you understand by Shift register? Explain serial-in parallel-out (SIPO) shift register with suitable diagrams. [6]
- OR
- Q9 a) Differentiate between synchronous and asynchronous sequential circuits. [4]  
 b) Draw the logic circuit of T-flip flop using JK-flip flop. [5]  
 c) What do you understand by Counter? Explain Ring counter with suitable diagrams. [6]

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**END TERM EXAMINATION**

THIRD SEMESTER [B. Tech] JANUARY 2024

Paper Code: AIML/AIDS/IOT-207

Subject: Principles of Artificial Intelligence

MAXIMUM MARKS: 75

Time: 3 Hours

Note: Attempt five questions from each unit including Q.No. 1 which is compulsory. Select one question from each Unit. Only scientific calculator is allowed.

- Q1 Attempt all questions:
- How Artificial intelligence, Machine Learning, and Deep Learning differ from each other? [2.5]
  - What are the characteristics of knowledge representation system? [2.5]
  - Discuss Fuzzy logic? [2.5]
  - Explain local minima problem? [2.5]
- Write short notes on **any one**:
- Expert Systems [2.5]
    - Logic Programming
  - Write short note on **any one**: [2.5]
    - Learning process in Artificial Neural Networks or data clusterization
    - Alpha Beta cutoff in game trees

**UNIT-I**

- Q2 Write and explain state space search formulation of well-known water jug problem? Describe the production rule for solving above problem. Demonstrate the working of Breadth-first search on water jug problem (Assume start and goal state). [10]
- Explain origin and history of Artificial Intelligence? [5]
- Q3 What is a heuristic search and where is it used? Write and explain A\* algorithm. Is A\* algorithm guaranteed to find an optimal goal path if one exists. Explain giving examples. [10]
- What are the different areas where AI has a great impact? Describe the use of computer vision in AI? [5]

**UNIT-II**

- Q4 How first order logic is used to represent knowledge. Demonstrate it with an example? Discuss the main issues in unifying two clauses? [10]
- Propose an application domain where backward chaining is possible. [5]
- Q5 Discuss the analysis required for choosing best search strategy? Describe Quantifiers and its types? [10]
- Represent the following facts as predicates. [5]
- Some men are mortal.
  - Tiya and Priya are batchmates.
  - Every student except Maryplays.
  - Everyone loves himself.
  - No one walks.

P.T.O.

[2-1]

**UNIT-III**

- Q6 Explain Bayesian Network or Dempster Shaler Theory? What are the different types of learning? Explain with examples. [10]

Discuss planning and its types? [5]

- Q7 Explain different types of reasoning with examples? Discuss uncertainty with examples of your own? [10]

Explain different task that must be performed for natural language understanding? [5]

**UNIT-IV**

- Q8 What is a static evaluation function in game tree? How does alpha beta pruning technique work? Discuss the role of AI in game development? [10]

Discuss current trends in AI? [5]

- Q9 What is Min Max Algorithm? Explain? Discuss emerging trends in AI? Explain Applications of AI in Robotics and Aerospace? [10]

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# END TERM EXAMINATION

THIRD SEMESTER [B.TECH] JANUARY 2024

Paper Code: AIDS/AMML/IOT-209

Time: 3 Hours

Note: Attempt five questions in all from each unit including Q.No.1 which is compulsory. Select one question from each unit. Assume missing data, if any.

Subject: Probability, Statistics & Linear Algebra

Maximum Marks: 75

Q1 a) State Chebyshev's inequality. (2.5)

b) If  $P(A) = \frac{1}{3}$ ,  $P(B) = \frac{1}{4}$  and  $P(A \cup B) = \frac{1}{2}$  then

find the conditional probability  $P(B|A)$ . (2.5)

c) Write a short note on Kurtosis. (2.5)

d) Find the projection of vector  $v = \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix}$  along vector  $w = \begin{bmatrix} 1 \\ 5 \\ 3 \\ 1 \end{bmatrix}$  in a vector space M of all  $2 \times 2$  matrices with inner product

$(A, B) = \text{trace}(B^T A)$ . (2.5)

e) Show that the matrix  $A = \begin{bmatrix} 1 & -2 & 1 \\ 3 & 3 & 3 \\ -2 & 1 & -3 \end{bmatrix}$  is Unitary matrix. (2.5)

f) If X is normally distributed with mean 30 and standard deviation 5, find the probability  $P(|X - 30| > 5)$ . (Use  $P(0 < z < 1) = 0.3413$ ) (2.5)

### UNIT-I

Q2 a) A player tossed 2 coins. If two heads show he wins Rs. 40. If one head shows he wins Rs. 20, but if two tail show he pays Rs. 30 as penalty. Calculate the expected value of money he will win in the game. (7.5)

b) If  $P(x) = ke^{-|x|}$  is the probability density function for  $-\infty < x < \infty$ , find the value of k and the probability  $P(0 < x < 4)$ . (7.5)

Q3 a) A factory has three machines X, Y and Z producing 1000, 2000 and 3000 bolts per day respectively. The machine X produces 1% defective bolts, Y produces 1.5% and Z produces 2% defective bolts. At the end of the day, a bolt is drawn at random and it is found to be defective. What is the probability that this defective bolt has been produced by machine X? (7.5)

b) A problem in mathematics is given to three students X, Y, Z whose chances of solving it are  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$  respectively. What is the probability that (i) problem will be solved, (ii) problem will not be solved

(7.5) P.T.O.

[2-1]

### UNIT-II

Q4 a) Find the Karl Pearson's coefficient of correlation r for the following data. (7.5)

X	1	2	3	4	5	6
Y	6	4	4	3	5	4

b) Find the regression coefficient of y on x for the following data. (7.5)

X	12	10	14	11	12	9
Y	18	17	23	19	20	15

Q5 a) In a normal distribution 31% of items are under 45 and 8% are over 64. Find the mean and standard deviation of the normal distribution. (7.5)  
 (Use  $P(-\infty < z < -0.495) = 0.31$  and  $P(0 < z < 1.405) = 0.42$ )  
 b) Determine the Binomial distribution for which mean is 4 and variance is  $\frac{4}{3}$ . Also, find the probability  $P(X > 1)$ . (7.5)

Q6 a) Fit the parabolic curve of regression of y on x for the following data. (8)

x	1	2	3	4
y	6	11	18	27

### UNIT-III

b) 40 people were attacked by a disease and only 36 survived. Will you reject the hypothesis that the survival rate if attacked by this disease is 85% in the favour of the hypothesis that is more at 5% level? (7.5)  
 (Use table value of  $Z_{\alpha} = 1.645$  for the right tail and  $|Z_{\alpha}| = 1.96$  for two tail test if  $\alpha = 5\%$ .)

Q7 a) Intelligent test of two groups of boys and girls gave the following results:

	Mean	S.D	Size
Girls	84	10	121
Boys	81	12	81

(i) Is the difference between mean scores of girls and boys significant? (5+5)  
 (ii) Is the difference between the standard deviations of scores of girls and boys significant?  
 b) In a sample of 1000 people, 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice eater and wheat eater are equally popular at 1% level of significance. (Table value  $|Z_{\alpha}| = 2.58$  for  $\alpha = 1\%$  for two tail)

### UNIT-IV

Q8 a) Find the LU decomposition of the matrix  $A = \begin{bmatrix} 1 & -3 & 5 \\ 2 & -4 & 7 \\ -1 & -2 & 1 \end{bmatrix}$ . (7.5)

b) Find the singular value decomposition of the matrix  $A = \begin{bmatrix} 2 & -1 \\ 2 \end{bmatrix}$ . (7.5)

Q9 Let U be the subspace of Euclidean space  $R^4$  spanned by the vectors: (8)  
 $v_1 = (1, 1, 1, 1)$ ,  $v_2 = (1, -1, 2, 2)$ ,  $v_3 = (1, 2, -3, -4)$ .  
 Apply Gram-Schmidt orthogonalization process to find orthogonal and orthonormal basis of U.  
 b) Find the projection of vector  $v = (1, 2, -3, 4)$  onto U. (7)

**END TERM EXAMINATION**

THIRD SEMESTER (B. TECH) JANUARY-2024

Paper Code: AIDS/AIML/IOT-211

Time: 3 Hours

Subject: Universal  
Human Values-II  
Maximum Marks: 75

Note: Attempt five questions including Q. no.1 which is compulsory.  
Select one question from each unit.

- Q1 (a) What is the difference between value education and moral education? (2)  
 (b) Differentiate intention and competence. (2)  
 (c) Investigate the parameters which differentiate Acceptance and Natural Acceptance. (2)  
 (d) What purpose does physical facility serve for a human being? (2)  
 (e) Define the term 'human value.' (2)  
 (f) Demonstrate an event which indicates reaction / response. (2)  
 (g) Explain 'human consciousness' and 'animal consciousness.' (3)
- UNIT-I**
- Q2 (a) Distinguish between Happiness and Excitement with suitable examples. (5)  
 (b) How can self-exploration help to ensure harmony in the Self? (5)  
 (c) What are the basic human aspirations and what are the requirements to fulfill them? Indicate their priorities. (5)  
 (a) Explain the need and basic guidelines of value education. (5)  
 (b) What is prosperity? Is there any difference between Prosperity and Accumulation of wealth? Explain with example. (5)  
 (c) Explain why people are not able to ensure the continuity of happiness? What is the way to ensure happiness in continuity? (5)
- UNIT-II**
- Q3 (a) The need for physical facilities is temporary while the need of the self is continuous, explain the statement with two examples. (5)  
 (b) How the needs of the Self can be fulfilled in continuity? (5)  
 (c) Define self-regulation and health. How are the two related? (5)  
 (d) What are the qualitative difference between the activities of the Self and those of the Body? Illustrate with example. (5)
- P.T.O.**

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- Q5 (a) Human being is the co-existence of Self and Body. Explain three distinguished attributes of the Self and Body with example. (5)  
 (b) Explain the way to ensure harmony in self (17) with the help of an example. (5)  
 (c) What is imagination? Is it taking place continuously or is that a temporary activity, justify your answer with example. (5)
- UNIT-III**

- Q6 (a) Distinguish between respect, glory and reverence. (5)  
 (b) What is the building block for harmony in the society? Explain with examples. (5)  
 (c) Describe the four human goals in the society. Compare them with the current state of society and suggest the way out. (5)
- Q7 (a) What is excellence? Is it working for competition the same as working for excellence? Demonstrate with the help of example. (5)  
 (b) Explain the feelings of care and guidance. (5)  
 (c) Explain the different bases of differentiation in relationship. Discuss any two problems in the Society that exist due to differentiation and suggest how value education can solve the problems. (5)
- UNIT-IV**

- Q8 (a) Explain Humanistic Constitution. (5)  
 (b) What is the role of material order and bio-order in the fulfillment of human needs? (5)  
 (c) Describe the natural characteristics of the four orders of Nature. How does the knowledge of natural characteristics of the four orders facilitate the participation of human being in the nature? (5)
- Q9 (a) Distinguish between units and space. (5)  
 (b) Describe the submergence of nature in Space. (5)  
 (c) "Natural acceptance is innate, invariant and universal." Explain this statement with any two examples. (5)
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AIDS/AIML/IOT-211

# END TERM EXAMINATION

THIRD SEMESTER [B.TECH] JANUARY 2024

Paper Code: AIDS/AIML/IOT-213

Subject: Critical Reasoning &  
Systems Thinking

Time: 3 Hours

Maximum Marks: 75

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit.

Q1 Answer the following questions: (Any Six)

- a) List out the importance of critical thinking in daily life. [2.5]
- b) What is the difference between Critical Reasoning and Uncritical Reasoning? [2.5]
- c) What is an argument? Give an example of an argument with two premises. [2.5]
- d) Indicate whether the following argument is deductive or inductive, "Ninety-eight percent of humans are mortal. Socrates is human. Therefore, Socrates is very likely to be mortal." Justify your answer with a relevant reason. [2.5]
- e) What is brainstorming? Explain, in brief. [2.5]
- f) What do you understand by the term, "Thinking outside the box"? [2.5]
- g) What is gambler's fallacy? Also, give a suitable example. [2.5]
- h) "Design thinking is different from other innovation and ideation processes." Discuss, in brief. [2.5]

## UNIT- I

- Q2
- a) List out the differences between "Analyzing Reasoning" and "Evaluating Reasoning". [7]
  - b) For each of the following passages indicate whether it constitutes an argument. For each argument specify what the conclusion is. [5]
    - i) The *Wall Street Journal* says that people should invest heavily in stocks. Therefore, investing in stocks is a smart move.
    - ii) If guns are outlawed, then only outlaws will have guns. Don't outlaw guns.
    - iii) Rose hates Julia, and she always upsets her, so she should avoid her.
    - iv) People should have a respect for life because their own ethical standards endorse it.
- Q3
- a) "A bias can cause the perpetuation of misconceptions and misinformation." Shed light on the assertion from the perspective of Critical Thinking. [7]
  - b) For each of the following passages, indicate whether it contains examples of selfinterested thinking or group pressure. Substantiate your answer with a relevant reason. [5]



- 9) Mary: Animals have the same rights as humans.  
 Jenny: What makes you think that?  
 Mary: I love animals, and there are so many that are treated horribly all over the world. It's heart breaking.  
 Christianity is superior to all other religions. I was raised Christian, and all my relatives are Christians. This is the only religion I've known, and the only one I need.

**UNIT-II**

- 9) Draw out the differences between enumerative and analogical induction. Also, provide suitable examples in support of your answer. [7]
- 10) For each of the following arguments, indicate whether it is valid or invalid. Justify your answer with a substantial reason. [8]
- i) Social welfare is by definition a handout to people who have not worked for it. But giving people money that they have not earned through labor is not helping anyone. It follows then that social welfare does not help anyone.
- ii) Either your thinking is logical or it is emotional. It's obviously not logical. It's emotional.

- 15) a) What is the difference between deductive and inductive arguments? Discuss the four-step procedure to evaluate whether the argument is deductive or inductive and sound or cogent. [7]
- b) Define as well as give an example of each of the following: [8]
- i) Fact
  - ii) Opinion
  - iii) Description
  - iv) Clarification

**UNIT-III**

- a) Discuss, in detail, the characteristics of effective and ineffective problem solvers. [7]
- b) What do you understand by the concept, "Fishbone Analysis"? What is its significance? Draft a fishbone diagram to analyze the causes of "Global Warming". [8]
- c) Discuss the common problems of team dynamics and, also, suggest some solutions to evade those problems. [7]
- d) "Six Thinking Hats Method is used to amplify creative conversations to get a variety of viewpoints and thinking styles." In light of the aforesaid statement, explain "Six Thinking Hats Method". Also, mention the benefits of this technique. [8]

P.T.O

- Q8 a) What is Critical Thinking? Discuss some common impediments that hinder the process of Critical Thinking with relevant examples. [7]
- b) What is "Systems Thinking"? How can you call it a holistic approach that maximizes efficiency to solve problems and to bring about a social change? [8]

**UNIT- IV**

- Q9 a) "According to the Indian tradition, knowledge is produced when the generating conditions are sound and knowledge is valid." In view of it, discuss the role of cognition and perception in Indian Knowledge Systems. [7]
- b) What is risk management? Discuss, in detail, some risk management tools that can help in developing and implementing a project. [8]

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 P-2/3

AJDS/ARV/L/IOT-2/13  
 P-3/2