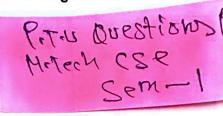*Petus Questions*
Mtech CSe
Sem—1

M.Tech. (CSE) (Sem.–1)
ADVANCED DATA STRUCTURES
Subject Code : MTCS-102-18
M.Code : 75154
Date of Examination: 16-12-2024

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :
1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWELVE marks.

1. (a) Define Dictionary and Dictionary with duplicates. List the operations performed on a dictionary.

   (b) Use linear probing, a hash table with b = 13 buckets, and the hash function $f(k) = k \bmod b$. Start with an empty hash table and insert pairs whose keys in order are 7, 42, 25, 70, 14, 38, 8, 21, 34, 11. Draw the hash table following each insert.

2. (a) Explain Skip List. Why it is called as a Randomized Data structure.

   (b) Explain the Operations Insertion, Deletion and Searching with a Skip List.

3. Suppose eight characters have a distribution A(l), B(l), C(l), D(2), E(3), F(5), G(5), H(10). Draw a Huffman tree and calculate average number of bits needed for each character.

4. Construct a binary search tree by inserting in the following sequence of integers: 50, 15, 62, 5, 20, 58, 91, 3, 8, 37, 60 and 24. Check whether the BST is balanced or not and if not balanced make it balanced.

5. What do you mean by range searching? Give appropriate examples of one dimensional range searching in order to explain the concept.

6. What is a Red black tree? What is the big-oh performance for find, insertion and remove for Red Black tree in best, worst and average cases.

7. What are quad trees? What are the steps in the construction of a quad tree? Explain search and insert functions in a quad tree.

8. What is computational geometry? What are the classical problems in the classical geometry? What are the computational geometry methods for problem solving? How various computational geometry methods can be used to efficiently solve new evolving problems?

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Total No. of Questions : 08

Total No. of Pages : 01

M.Tech. (CSE) (Sem.–1)
MACHINE LEARNING
Subject Code : MTCS-105-18
M.Code : 75155
Date of Examination : 07-01-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :
1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWELVE marks.

1. a) How does the Nearest-Neighbors algorithm works?

   b) How decision trees are used in Machine Learning?

2. a) Discuss the main objective of Linear Regression.

   b) What is the primary concept of a Support Vector Machine (SVM) in a classification?

3. a) What is the primary goal of Statistical Learning Theory?

   b) Discuss how RandomForests works?

4. What is PCA in machine learning? How does PCA achieve dimensionality reduction in a dataset?

5. Define following :

   a) Bayesian Learning

   b) Distributed learning

6. Discuss the main objective of deep learning and how does it help in improving model performance?

7. Provide an example of a task that can be effectively solved using reinforcement learning.

8. Discuss the latest advancements in machine learning techniques for enhancing IoT data analysis and decision making.

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Total No. of Pages : 02

Total No. of Questions : 08

M.Tech.(CSE/ECE/EE/Power System/VLSI Design) (Sem.–1)

RESEARCH METHODOLOGY AND IPR

Subject Code : MTRM-101-18

M.Code : 75161

Date of Examination :24-12-2024

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWELVE marks.

1. Write short note on the following:

   a) Components of a research problem.

   b) Characteristics of a good research problem.

2. Differentiate between primary and secondary data. Explain various methods of data collection.

3. What is the best way to prevent plagiarism and fraud in research? How can you avoid unintentional plagiarism when revising your draft?

4. Write a short note on the following:

   a) What is a trademark? How it is different from brand?

   b) What kind of products are covered under industrial design protection?

   c) Enlist the types of works covered by copyright.

5. a) Differentiate between industrial design, trademark, and patent.

   b) Discuss the procedure for grant of a patent.

6. Elaborate in detail the significance of research reports and investigate the different steps involved in writing such a report.

7. Elaborate the following :

   a) IPR of Biological Systems

   b) New developments in IPR

8. A plant has installed two machines producing polythene bags. During the installation, the manufacturer of the machine has stated that the capacity of the machine is to produce 20 bags in a day. Owing to various factors such as different operators working on these machines, raw material, etc. There is a variation in the number of bags produced at the end of the day. The company researcher has taken a random sample of bags produced in 10 days for machine 1 and 13 days for machine 2, respectively. The following data gives the number of units of an item produced on a sampled day by the two machines:

| Machine 1 | 18 | 19 | 19 | 18 | 17 | 19 | 18 | 19 | 18 | 19 | | | |
| Machine 2 | 16 | 17 | 17 | 17 | 16 | 18 | 16 | 16 | 17 | 17 | 16 | 16 | 17 |

How can the researcher determine whether the variance is from the same population (population variances are equal) or it comes from different populations (population variances are not equal)? Take $\alpha = 0.05$ as the confidence level.

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Total No. of Pages : 01

Total No. of Questions : 08

M.Tech. (Computer Science & Engineering) (Sem.–1)
DATA SCIENCE
Subject Code : MTCS-108-18
M.Code : 75158
Date of Examination : 15-01-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :
1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWELVE marks.

1. Define Data Science. Explain the various components of Data Science in detail.

2. Differentiate between AI, BI, Machine Learning and Data Science.

3. What are the various sources of data collection? How the data is collected and stored?

4. Differentiate between Linear Regression and Polynomial Regression.

5. Explain Naive Bayes with the help of example.

6. How data is pre-processed using python?

7. Write a note on recent trends in data collection and analysis.

8. Explain binning method used in pre-processing of data.

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Total No. of Questions : 08

M.Tech. (CSE) (Sem.–1)

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Subject Code : MTCS-101-18

M.Code : 75153

Date of Examination : 16-01-2025

Max. Marks : 60

Time : 3 Hrs.

INSTRUCTIONS TO CANDIDATES :
1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWELVE marks.

1. Define variance and co-variance. How and where they are used?

2. Discuss the concept of probabilistic inequalities Markochains with example.

3. What is sampling? What are its types? Explain.

4. Write a note on methods of moments and maximum likelihood.

5. Define PCA. How and when it is used? Discuss with example.

6. Write a note on planar graphs, graph coloring and Euler cycles.

7. Differentiate between Operating Systems and Distributed Systems.

8. Explain recent trends of mathematical foundation in biometric and soft computing.

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