

END TERM EXAMINATION

THIRD SEMESTER (MCA) JANUARY 2024

Paper Code: MCA-203

Subject: Artificial Intelligence and Machine Learning

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, briefly: (2.5×10=25)

- Illustrate problem characterization.
- Write three ethics of AI.
- Explain travelling salesman problem. How can a real function be maximized or minimized.
- Distinguish between monotonic and non-monotonic reasoning.
- Compare total sum of squares, sum of squares of residuals, sum of square of regression.
- Compose a pseudocode for Means End Analysis (MEA).
- Differentiate between supervised and unsupervised machine learning techniques.
- Explain confusion matrix. Why do we need confusion matrix?
- Identify various activation functions involved in neural networks.
- Explain content-based recommender systems.

UNIT - 1

Q2. (a) Given an initial and final state of 8 puzzle problem. Find the most cost-effective path to reach the final state from initial using A* algorithm. (6.5)

Start State

3	4	2
7		6
5	1	8

Goal State

1	2	3
8		4
7	6	5

(b) Discuss various problems in hill climbing algorithms and how they can be prevented. (6)

OR

Q3. (a) Differentiate between AI, ML and Deep Learning while providing suitable examples. (6.5)
(b) Discuss Constraint satisfaction algorithms. (6)

UNIT - II

Q4. (a) Check the validity of the following implications via truth table. (6.5)
 $P - (Q - R)$ equivalent to $(P - Q) - (P - R)$
(b) What are forward and backward search planning? Explain with the help of example. (6)

OR

Q5. (a) Explain the following term providing an example (6.5)
(i) Modus Ponens
(ii) Modus Tollen
(b) Trace the constraint satisfaction procedure to solve the following cryptarithmic problem: (6)

C R O S S
 + R O A D S

 D A N G E R

MCA-203

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UNIT - III

Q6. (a) A market trader sells ball-point pens on his stall. He sells the pen for a different fixed price, x , in each of the six weeks. He notes the number of pens, y that he sells in each of these six weeks. The results are shown in the following table. (6.8)

x	10	15	20	25	30	35
y	45	46	37	49	36	48

Calculate the equation of the least squares regression line of y on x .

(b) Elaborate Coefficient of determination, correlation and confusion matrix with equation and proper notation (6)

OR

Q7. (a) Elaborate Multiple Linear Regression (MLR) with equations. (6.5)

(b) Suppose 10000 patients get tested for flu; out of them, 9000 are actually healthy and 1000 are actually sick. For the sick people, a test was positive for 620 and negative for 380. For the healthy people, the same test was positive for 180 and negative for 8820. Construct a confusion matrix for the data and compute the precision and recall for the data. (6)

UNIT - IV

Q8. (a) Differentiate between bagging and boosting algorithms. (6.5)

(b) Elaborate the formula for Pearson's correlation coefficient. Can Pearson's correlation coefficient measures correlation between points on a circle? (6)

OR

Q9. (a) Discuss the algorithm for a recommender system which uses collaborative filtering. (6.5)

(b) Design a neural network model for 5 inputs, 2 hidden layers having 3 and 2 neurons respectively and 1 output. Show various calculations involved to get the output. (6)

prediction machine information

MCA-203
P2/2

END TERM EXAMINATION

THIRD SEMESTER [MCA] JANUARY 2024

Paper Code: MCA 239

Subject: Software Quality Management

Time: 3 hrs.

Maximum Marks: 75

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

Q1 Answer all the following questions briefly: (2.5x10=25)

- a) Explain the objectives of Software Quality Assurance Activities.
- b) List the components of a software quality assurance system?
- c) Contrast corrective and adaptive maintenance?
- d) Define the cost of quality?
- e) Explain the two contract review stages?
- f) Identify the factors that affect the extent of the contract review?
- g) Discuss the benefits of preparing development and quality plans for small projects?
- h) Distinguish between process and product metrics?
- i) Compare between CMM and CMMI?
- j) What are the advantages of CASE tools in assessing software quality?

UNIT-I

- Q2 a) Pressman's definition of quality requires the client to specify the software requirements because only documented requirements are binding for the developer. Any omissions or errors made by the client are considered as his or her fault, and not listed among the developer's errors. (6.5)
- (1) How can a client be sure that his or her organization has the professional capabilities to cope with this issue?
 - (2) In what ways can the developer support the client in this matter?
 - (3) Suggest pro and con arguments to Pressman's definition of the client's responsibility.
- b) With respect to software quality assurance, elaborate the challenges of software quality? (6)

- Q3 a) Establish the relationship between software quality and the software development life cycle? (6.5)
- b) Distinguish and explain the differences between software quality assurance and quality control? (6)

UNIT-II

- Q4 a) Describe the software project life cycle components in detail? (6.5)
- b) Differentiate between review, audit planning and implementation? (6)

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MCA-239

- Q5 a) Describe management roles in software quality management? (6.5)
- b) Explain the importance of software configuration management in modern quality paradigms such as SEI CMM and ISO 9001. What problems might arise if a development organization does not use any configuration management tool? (6)

UNIT-III

- Q6 a) Elaborate the contribution of CASE tool to software product and maintenance? (6.5)
- b) Explain any 4 software quality product metrics? How these values will be useful for the software engineer? (6)
- Q7 a) Explain any 4 software quality process metrics? How these values will be useful for the software engineer? (6.5)
- b) Elaborate through suitable example, how software project quality affects software maintenance? (6)

UNIT-IV

- Q8 a) Assess how the six-sigma standard helps ensure software quality? (6.5)
- b) Elaborate the classic and extended model of cost of software reliability? (6)
- Q9 a) Discuss the SQA challenges and capabilities? (6.5)
- b) Explain the stages of ISO 9001 process. Who will be the auditors and why does an organization need it? (6)

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MCA-239

END TERM EXAMINATION

THIRD SEMESTER [MCA], JANUARY- 2024

Paper Code: MCA-225

Subject: e-Business Systems

Time: 3 Hrs.

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, briefly:

- (2.5×10=25)
Scale, logics
- Compare e-commerce with traditional commerce.
 - Discuss the key drivers of e-commerce in India.
 - Differentiate between intranet with extranet.
 - Describe the strengths and weakness of data encryption standard (DES) algorithm?
 - What is firewall and how it ensures security in an organization's network?
 - List the characteristics of merchant account in electronic payment system.
 - Discuss the infrastructure issues in electronic fund transfer (EFT).
 - Explain the direct debit and direct deposit payment approaches.
 - Identify and elaborate different types of revenue models used for online newspapers.
 - Explain the dropshipping model of e-commerce with its benefits and disadvantages.

UNIT-I

- Q2 a) Describe various web-based tools available for e-commerce. Explain the role of enterprise resource planning (ERP) for an e-commerce business. (6.5)
- b) Identify the role of a strategic business unit of a business. Discuss the primary activities conducted by the strategic business unit of a business. (6)

OR

- Q3 a) Explain the industry value chain? Create the industry value chain for a wooden chair. (6.5)
- b) Describe various connection options of Internet with their advantages and disadvantages. With a neat diagram, explain the working of router-based architecture of the Internet. (6)

UNIT-II

- Q4 a) Discuss security threats and issues in e-commerce. List important security mechanisms to address such issues. (6.5)
- b) Explain CIA tried in context to security of information system resources. List the best practices to implement CIA to secure the information system resources. (6)

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OR

- Q5 a) What is digital signature? Demonstrate (with an appropriate diagram) the working of security mechanism implement with digital signature. (6.5)
- b) Explain the working of public key cryptography with a suitable diagram. Apply RSA algorithm to encrypt the plain-text message $m = 9$ with prime numbers $p = 7$ and $q = 11$ to generate the public and private keys. (6)

UNIT-III

- Q6 a) Describe electronic fund transfer (EFT). Elaborate different type of EFT payments. (6.5)
- b) Illustrate electronic data interchange (EDI) with its types and advantages. (6)

OR

- Q7 a) Differentiate between payment processor and payment gateway. Elaborate the working of payment gateway in electronic payment with credit card. (6.5)
- b) Explain the 3D secure payer authentication process. Discuss the Payment Card Industry (PCI) compliance in payment solutions. (6)

UNIT-IV

- Q8 a) Explain the role of e-governance in the Indian context. Identify the challenges associated with e-governance in India. (6.5)
- b) Describe the essential components of a business model. Discuss the business model followed by Netflix. (6)

OR

- Q9 a) What is revenue model? Explain the following revenue models over Internet, by giving suitable examples for each model: (a) web catalog revenue model, (b) free for many, fee for a few revenue model, and (c) fee-for-service revenue model. (6.5)
- b) Discuss different types of strategies for online business models. (6)

MCA-225

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MCA-225

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END TERM EXAMINATION

THIRD SEMESTER [MCA] JANUARY 2024

Paper Code: MCA-201

Subject: Design and Analysis of Algorithms

Time: 3 Hours

Maximum Marks: 75

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

Q1 Answer all the following questions briefly: (2.5x10=25)

- a) Define the terms Best case, Worst case and Average case time complexities.
- b) What is the smallest value of n such that an algorithm whose running times is 100n² runs faster than an algorithm whose running time is 2n on the same machine
- c) Analyse the complexity of the following function void function(int n)


```

{
  int count = 0;
  for (int i=n/2; i<=n; i++)
    for (int j=1; j<=n; j = 2 * j)
      for (int k=1; k<=n; k = k * 2)
        count++;
}

```
- d) Write the applications of BFS and DFS.
- e) Define a B-tree. Give an example.
- f) Define spanning tree of a graph. Write the total number of spanning trees possible for a complete graph with 6 vertices.
- g) List and explain the characteristic properties associated with a problem that can be solved using dynamic programming.
- h) Explain Divide and Conquer strategy
- i) State Master Theorem
- j) Implement UNION using linked list representation of disjoint sets

UNIT-I

- Q2 a) Solve using Masters theorem i) $T(n)=2T(n/4) + \sqrt{n}$ (6.5)
ii) $T(n)=7T(n/2) + n^2$
- b) Write an algorithm to merge 2 sorted arrays into a single sorted array. (6)

Q3 a) Analyse the complexity of the following functions (6.5)

```

i) function(int n)
{
  if (n==1) return;
  for (int i=1; i<=n; i++)
  {
    for (int j=1; j<=n; j++)
    {
      printf("%d");
      break;
    }
  }
}

ii) void function(int n)
{
  int i=1, s=1;
  while (s <= n)
  {
    i++; s += i;
    printf("%d");
  }
}

```

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MCA-201
P_{1/2}

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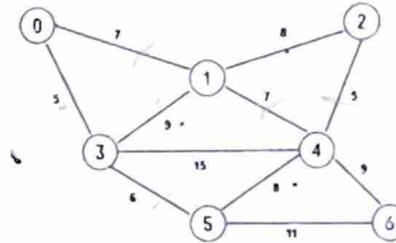
- b) Solve the recurrence using recursion tree method: $T(1) = 1$ (6)
 $T(n) = 3T(n/4) + cn^2$

UNIT-II

- Q4 a) Construct a Red Black tree by inserting 10,20,30,15,16 and 27 into an initially empty tree and also delete 15,16 and 30 from the tree (6.5)
- b) Explain Strassen's matrix multiplication and analyze its complexity (6)
- Q5 a) Give a control abstraction for Divide and Conquer method. Explain with an example. (6.5)
- b) Explain the advantages of using height Balanced Trees? Explain AVL Rotations (6)

UNIT-III

- Q6 a) Formulate Fractional Knapsack Problem. Write Greedy Algorithm for fractional Knapsack Problem. (6.5)
- b) Find the optimal solution for the following fractional Knapsack problem. Given number of items(n)=4, capacity of sack(m) = 60, $W=\{40,10,20,24\}$ and $P=\{280,100,120,120\}$ (6)
- Q7 a) Compute the Minimum Spanning Tree and its cost for the following graph using Kruskal's Algorithm. Indicate each step clearly. (6.5)



Handwritten notes: "Algorithm" and "DP" with arrows pointing to the graph.

- b) Write down Bellman Ford algorithm and analyze the complexity. What is the time complexity of Bellman-Ford single-source shortest path algorithm on a complete graph of n vertices? (6)

UNIT-IV

- Q8 a) With examples explain polynomial time reducibility (6.5)
- b) How Travelling Salesperson Problem can be solved using Branch and bound (6)
- Q9 a) Draw the state space tree for 4 Queens problem. (6.5)
- b) Define NP-Hard and NP-complete problems. (6)

MCA-201
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END TERM EXAMINATION

THIRD SEMESTER [MCA] JANUARY 2024

Paper Code: MCA-253

Subject: Cyber Security and Cyber Laws

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 Attempt all questions:- (10x2.5=25)
- (a) Differentiate between Active and Passive Attacks
 - (b) What do you mean by phishing?
 - (c) What are E-Contracts?
 - (d) Explain the concept of Digital Signature.
 - (e) Distinguish between public key and private key.
 - (f) Why do we need cyber laws? Explain.
 - (g) Explain the provision for the protection of online Trademarks under the Trademark Act 1999
 - (h) What are Botnets? Explain.
 - (i) Discuss the challenges in computer forensics.
 - (j) What is Cyberstalking? Differentiate between Cyberstalking and Cyberbullying.

UNIT-I

- Q2 (a) How Criminal Plan the Attack? Explain various steps. (6)
(b) What is data security? Explain different methods for protection of computer data. (6.5)
- Q3 (a) Distinguish between Cyber crimes and conventional crimes. (6)
(b) What is Wireless LAN? How to secure wireless network infrastructure? (6.5)

UNIT-II

- Q4 (a) What is Malware? Write the steps to remove the malware from your PC. (6)
(b) Explain the main techniques hackers can use to get hold of your password. (6.5)
- Q5 (a) What is SQL Injection? Write steps for SQL Injection attack on Insert, Update and Delete. (6)
(b) What are DoS and DDoS attacks? Briefly explain different types of DoS attacks. (6.5)

UNIT-III

- Q6 (a) Explain the difference between HTTP and HTTPS. Why is difficult to attack an HTTPS connection? (6)
(b) What is Intrusion Detection Systems? What are different methods for Intrusion Detection? (6.5)
- Q7 (a) What is Intrusion Prevention? Explain different approaches for Intrusion Prevention. (6)
(b) What is a Firewall? Why is it important? Briefly explain different types of firewalls. (6.5)

UNIT-IV

- Q8 (a) Explain how an Appeal can be made under the IT Act 2000. (6)
(b) Explain how Intellectual property Laws protect the rights of the owner of the Intellectual Property. (6.5)
- Q9 (a) Write short notes on: (6)
(i) Cyber Forensic
(ii) Cyber space jurisdiction
(b) What are the objectives of IT Act 2000? The IT Act is not applicable to some specific documents. Comment. (6.5)