MCA.II/11.25.001 Reg.No.

MCA DEGREE SECOND SEMESTER EXAMINATION, APRIL 2025
22-382-0201 COMPUTER NETWORKS
(Regular/Supplementary)

Write any FIVE questions.
(Each Question Carries 10 Mark)

Time-3 Hours **Maximum Marks :50**

Q.No		QUESTIONS	MARKS	CO	BL	PI
1.	a.	Imagine you are designing a new wireless communication standard. How would you decide between CSMA/CA and CSMA/CD for medium access control?	5	CO1	L5	2.2.4
	b.	Briefly explain different transmission errors with suitable example.	5	CO2	L2	3.1.1
		OR				
2.	a.	Compare and contrast Ethernet and Wi-Fi technology.	5	CO2	L2	3.1.1
	b.	In a high-speed data acquisition system deployed for an industrial automation setup, reliable and synchronized communication is crucial between sensors and the control unit. Explain how different digital encoding techniques, NRZ, NRZI, and Manchester encoding affect signal synchronization, bandwidth usage, and error detection in such real-time systems. Which encoding method would you recommend for this environment and why? Support your answer with appropriate reasoning based on practical constraints.	5	CO2	L2	3.1.1
3.	a.	How do modern Local Area Networks ensure efficient device-to-device communication while avoiding unnecessary data collisions? Illustrate with a suitable network structure.	5	CO2	L2	1.7.1
	b.	A bit stream 11010101 is transmitted using the standard CRC method. The generator polynomial is x^3+x^2+1. **i.** What is the actual bit string transmitted? **ii.** Suppose the fifth bit from the left is inverted during transmission. How will receiver detect this error?	5	CO2	L2	1.7.2
		OR				
4.	a.	A company is experiencing frequent data corruption in transmission. Would you suggest Cyclic Redundancy Check (CRC) or simple parity checks? Justify your choice.	5	CO3	L2	2.2.4
	b.	Give a brief detail on the IEEE 802.11 technology.	5	CO2	L2	2.2.4

5.		Two companies merge, and their IP addressing schemes overlap. What techniques can be used to resolve this conflict efficiently. Briefly explain the concept along with a suitable example.	10	CO3	L4	2.6.4
		OR				
6.	a.	Routing tables in an ISP network change dynamically. How does BGP help in maintaining efficient inter-domain routing?	5	CO3	L2	2.2.4
	b.	Compare and contrast Link State and Distance Vector algorithms.	5	CO2	L2	2.2.4
7.	a.	A live-streaming service struggles with high latency and congestion. Would TCP or UDP be the better choice? Explain your decision.	5	CO3	L2	2.2.4
	b.	Differentiate between Go-back-N and Selective Repeat method.	5	CO2	L2	2.2.4
		OR				
8.	a.	Why does TCP use a three-way handshake instead of a two-way handshake? How does it impact security and reliability?	5	CO3	L4	2.2.4
	b.	Differentiate between Leaky bucket and Token bucket techniques.	5	CO2	L2	2.2.4
9.	a.	Describe the mechanism that enables two processes to communicate over a network, ensuring reliable data transmission.	5	CO2	L2	2.2.4
	b.	Differentiate between SMTP and DNS.	5	CO2	L2	2.2.4
		OR				
10		Elaborate on the role of the Application Layer in the TCP/IP model. Discuss how it facilitates user interaction and supports end-user services. Explain in detail how the application layer protocols work.	10	CO2	L2	3.1.1

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MCA.II/04.25.002 Reg.No.

B

MCA DEGREE SECOND SEMESTER EXAMINATION, APRIL 2025
22-382-0202 OPERATING SYSTEMS
(Regular)

Write any FIVE questions.
(Each Question Carries 10 Mark)

Time-3 Hours **Maximum Marks :50**

Q.No		QUESTIONS	MARKS	CO	BL	PI
1.		i. Briefly explain how an OS manages concurrent processes for efficient CPU utilization.	3.5	CO2	L2	1.6.1
		ii. What are the key characteristics of a good process scheduler ?	2.5			
		iii. Consider the following set of processes with the arrival times and the CPU burst times given in milliseconds. Calculate the average turnaround time with preemptive and non preemptive shortest job scheduling algorithm. Also draw the chart for both the scheduling algorithms.	4			

Process	Arrival Time	Execution Time
P1	0	12
P2	4	5
P3	5	4
P4	5	2
P5	7	1

Use FIFO strategy for tiebreaking.

OR

2.		i. Explain the concept of process synchronization in operating systems. Why is it necessary?	5	CO1	L2	1.6.1
		ii. Define a semaphore and describe its role in process synchronization. Differentiate between binary semaphores and counting semaphores, providing examples of their usage.	5			

3.		i. List and Briefly explain the features of the Distributed operating system? ii. Address any 3 issues associated with distributed computing.	7 3	CO1	L2	2.5.1
		OR				
4.		Draw the Resource Allocation Graph and populate Wait-for-Graph corresponding to the given scenario and check for the existence of deadlock. Scenario: **Processes:** P1, P2, P3, P4, P5 **Resources:** CPU, Memory, Disk, Network, Printer, Database, File Resource already allocated and Requests by the processes: P1 currently holds the File and is waiting for the Printer. P2 holds the Printer and is waiting for the Database. P3 holds the Database and is waiting for the Memory. P4 holds the Memory and is waiting for the Disk. P5 holds the Disk and is waiting for the File.	10	CO2	L2	2.5.1
5.		i. A process is loaded into memory with a base address of 1000 and a limit register value of 1200. a) What is the range of valid logical addresses for this process? b) If the process generates a logical address of 850, what will be the physical address? c) What will happen if the process tries to access a logical address of 1250? ii. Given memory partitions of 120 KB, 350 KB, 200 KB, 400 KB, and 250 KB, how would each of the First Fit, Best Fit, and Worst Fit memory allocation algorithms allocate memory to the following processes: 115 KB, 370 KB, 90 KB, and 275 KB? Illustrate the memory allocation step-by-step for each strategy.	3 7	CO3	L3	2.5.1

OR

6.		Consider a system with 3 page frames and the following page reference string: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2 Calculate the number of page faults that would occur using: a) First-In-First-Out (FIFO) b) Least Recently Used (LRU) c) Optimal Page Replacement Show the step-by-step process for each algorithm.	10	CO4	L3	2.5.1
7.		Explain different file allocation methods and explain the protection strategies adopted by the OS to protect the files from other user processes.	10	CO3	L2	1.6.1

OR

8.		i. Explain the difference between deadlock prevention, deadlock avoidance, and deadlock detection. ii. A system has 5 processes P0 to P4 and 3 resource types: A (10 instances), B (5 instances), C (7 instances). Allocation Matrix:	2 8	CO3	L2	1.6.1

	A	B	C
P0	0	1	0
P1	2	0	0
P2	3	0	2
P3	2	1	1
P4	0	0	2

Maximum Matrix:

	A	B	C
P0	7	5	3
P1	3	2	2
P2	9	0	2
P3	2	2	2
P4	4	3	3

a) Is the system in a safe state? If so, provide a safe sequence.

b) What happens if P1 requests (1, 0, 2)? Can the request be granted?

9.		Explain different security features available in an OS.	10	CO5	L2	2.5.1
		OR				
10.		Consider an OS consisting of 4 files named salary files, promotion list, Circulars and performance report and 4 users named A, B, C and D. Certain users are allowed to read (R), write (W), execute (E), and delete (D) the files. In this system, A is allowed to delete the promotion list,where B is allowed to only read and execute this file and C has full access to this file. On Salary file, A and B has all the permissions but C and D has just read permission to this file. The user A is allowed to delete the performance report, and B and C have the right to read and execute this file. Circulars are managed by A with full access rights and B,C, and D have read the file. Create an Access Control Matrix based on the above mentioned criteria.	10	CO5	L3	2.5.1

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MCA.II/04.25.003 Reg.No. | | | | | | | | |

C

MCA DEGREE SECOND SEMESTER EXAMINATION, APRIL 2025
22-382-0203 MACHINE LEARNING
(Regular)

Write any FIVE questions.
(Each Question Carries 10 Mark)

Time-3 Hours **Maximum Marks :50**

Q.No		QUESTIONS	MARKS	CO	BL	PI
1.	a.	Given the data set {100, 400, 1000, 500, 2000}, perform the following normalization techniques: (a) Z-Score Normalization (b) Min-Max Normalization, scaling the data to the range [1, 10] (c) Decimal scaling	6	CO1	L3	1.3.1
	b.	How would you apply data reduction techniques to improve the performance of a machine learning model on a large dataset? Provide a specific example.	4	CO1	L3	1.1.2
		OR				
2.	a.	A hospital has developed two machine learning models (Classifier A and Classifier B) to predict whether a patient will attend their scheduled appointment or miss it. The objective is to proactively manage scheduling and minimise the frequency of missed appointments. A patient is classified as 'Attended' if they arrive within 15 minutes of the scheduled time, and 'Missed' if they fail to show up or arrive more than 15 minutes late. Both the classifiers were tested on a dataset of 500 appointments, and their prediction results are shown below: Derive the confusion matrices for the two classifiers A and B and determine which is the preferable classifier (A or B) in terms of Accuracy and F1-Score?	6	CO1	L3	1.3.1

	ACTUAL	
	Attended	Missed
Classifier A, predicted attended	131	155
Classifier A, predicted missed	19	195
Classifier B, predicted attended	82	72
Classifier B, predicted missed	68	278

	b.	John surveyed 60 individuals about their favourite colour and grouped the responses into five categories as shown in the table below. Draw a pie chart to display John's findings. Colour | Red | Blue | Green | Yellow | Other Frequency | 10 | 13 | 24 | 5 | 8	4	CO1	L3	1.2.1
3.		Consider the following transaction database where each row represents a transaction (T1 to T5), and the columns (A, B, C, D, E, F and G) indicate the presence (1) or absence (0) of an item in that transaction. Suppose the minimum support is 60% and the minimum confidence be 75%. Then, compute all frequent itemsets and the valid association rules using Apriori algorithm? TID | A | B | C | D | E | F | G T1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 T2 | 1 | 1 | 1 | 1 | 1 | 0 | 0 T3 | 1 | 1 | 1 | 0 | 0 | 0 | 1 T4 | 1 | 0 | 1 | 0 | 0 | 1 | 0 T5 | 1 | 1 | 0 | 1 | 1 | 1 | 0	10	CO2	L3	1.1.1
		OR				
4.		Use FP-Growth algorithm to find out all the frequent item sets and the strong association rules from the transaction database shown in Question No. 3. Assume, min_sup=60% and min_conf = 75%.	10	CO2	L3	1.1.2
5.		Given the following training dataset, use Baye's Classifier to determine the gender of a person having Height = 6 feet, Weight = 130 lbs and Foot Size = 8 inches. Assume that the features Weight, Height and Foot Size follows Gaussian distribution. Height (feet) | Weight (lbs) | Foot Size (inches) | Gender 6.00 | 180 | 12 | Male 5.92 | 190 | 11 | Male 5.58 | 170 | 12 | Male 5.92 | 165 | 10 | Male 5.00 | 100 | 6 | Female 5.50 | 150 | 8 | Female 5.42 | 130 | 7 | Female 5.75 | 150 | 9 | Female	10	CO3	L3	1.3.1

OR

6.		A research organization is working on a classification task to distinguish the species of an individual as either Aliens (A) and Humans (H) based on the following features: Green (Yes/No), Number of Legs (2 or 3), Height (Short/Tall) and Smelly (Yes/No). The training data is provided in the table below. Use this training data to construct a decision tree using the ID3 algorithm.	10	CO3	L3	1.3.1

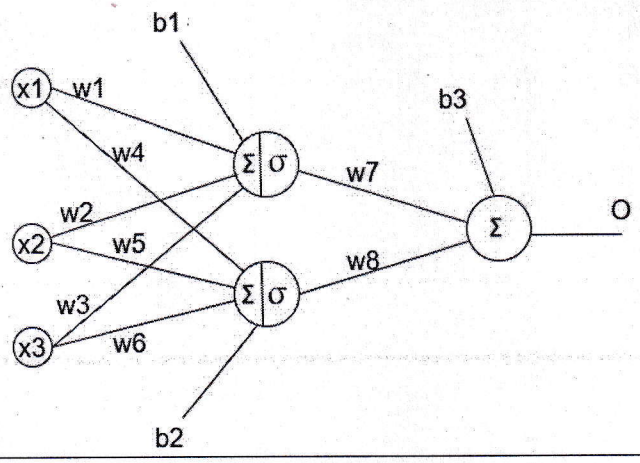
Green	No of Legs	Height	Smelly	Species
No	3	Short	Yes	Allien
Yes	2	Tall	No	Alien
Yes	3	Tall	No	Allien
No	2	Short	Yes	Allien
Yes	3	Tall	No	Allien
No	2	Tall	Yes	Human
No	2	Short	No	Human
No	2	Tall	No	Human
Yes	2	Short	No	Human
No	2	Tall	Yes	Human

7.		Apply K-Means clustering on the following set of data points: P1(2,4), P2(2,6), P3(5,6), P4(4,7), P5(8,3), P6(6,6), P7(5,2), P8(5,7), P9(6,3), P10(4,4). Let K=3 and use Euclidean distance as the similarity measure. Also, assume the initial centroids as: C1(4,1), C2(1,5) and C3(8,4).	10	CO4	L3	1.1.1

OR

8.		Apply complete linkage clustering technique on the following set of data points: P1(0.40, 0.53), P2(0.22, 0.38), P3(0.35, 0.32), P4(0.26, 0.19), P5(0.08, 0.41) and P6(0.45, 0.30). Use Euclidean distance and the similarity measure and also draw the dendrograms.	10	CO4	L3	1.1.2
9.		Explain Perceptron learning algorithm and use it to learn optimal weights for a perceptron that implements a 2 input OR gate. Assume the initial values for the weights corresponding to the inputs are [0.5, 0.8] and bias is 0.	10	CO5	L3	1.1.2

OR

10		The following figure shows a multi-layered network of neurons. Compute the updates in weights for the network after performing one backward pass of the backprogation algorithm. Here, b1, b2 and b3 corresponds to the bias terms. Let the learning rate be 0.01, the input to the network be $[x_1, x_2, x_3] = [60, 80, 5]$ and the actual output (O) is 82. Assume that the initial values for the weights be: w1=0.1, w2=0.15, w3=0.1, w4= 0.05, w5=0.1, w6= -0.2, w7= 12 and w8=2. Also, the initial values for the bias terms are b1= -15, b2=-15 and b3=20. 	10	CO5	L3	1.1.2

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MCA.II/04.25.004 Reg.No. | | | | | | | | |

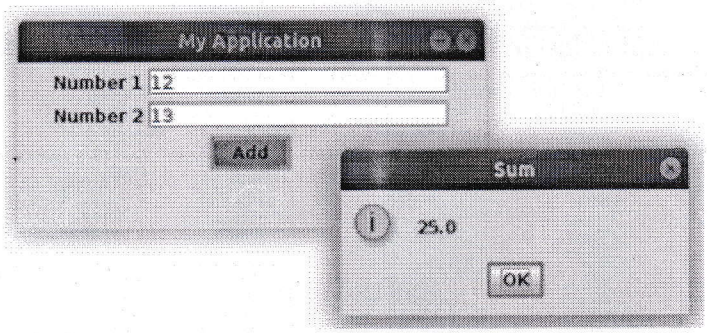
A

MCA DEGREE SECOND SEMESTER EXAMINATION, APRIL 2025
22-382-0204 OBJECT ORIENTED PROGRAMMING
(Regular)

Answer any FIVE questions.
(Each Question Carries 10 Mark)

Time-3 Hours **Maximum Marks :50**

Q.No		QUESTIONS	MARKS	CO	BL	PI
1.	a.	Explain any 4 OOP concepts and Explain how OOP different from Procedure Programming.	5	CO1	L3	1.1.2
	b.	What are the Principles of Object Oriented Programing?	5	CO1	L3	1.1.2
		OR				
2.		With a suitable program, explain the structure, flow and object-oriented features of Java Program.	10	CO1	L3	2.2.2
3.	a.	Explain the scope of constructors and constructor overloading in Java with code example.	5	CO2	L2	1.1.1
	b.	Illustrate recursion in Java with code example. Write a note on String buffer.	5	CO2	L2	1.1.1
		OR				
4.		Explain the compile time and run time polymorphism in Java with proper code example.	10	CO2	L2	1.3.1
5.	a.	Exemplify the scope of Interfaces. With an ample example illustrate how interfaces are used.	5	CO3	L2	2.4.1
	b.	A national bank has 3 main subdivisions, each sub division is again subdivided and accessing data from multiple banks. What kind of inheritance is this? Explain your findings.	5	CO3	L2	2.4.1
		OR				
6.	a.	Why packages are used in Java? Write a program to create package to calculate the income tax of an employee and use it in another program . (if the annual salary is 12 lakh, there is no tax , up to 18 lakh the tax is 10%, upto 24 lakh the tax is 15%, above 24 lakh the tax is 30%. Input the annual salary from main program).	5	CO3	L2	2.4.1
	b.	Write a program to read a text file and update it. Delete the file after use.	5	CO3	L2	2.4.1

7.	a.	Explain various types of errors occurred in programming with suitable examples.	5	CO4	L3	3.2.1
	b.	What is exception Handling, illustrate the difference between throw and throws with suitable examples.	5	CO4	L3	3.2.1
		OR				
8.		Write a multithreaded program to illustrate synchronization of threads using synchronized() block.	10	CO4	L3	3.2.1
9.		Write a GUI based application to perform addition of real numbers. Use the template given below. Sum is printed after clicking the add button.  	10	CO5	L3	1.3.1
		OR				
10		Create a GUI based application to illustrate Java Swing primitives and event handling.	10	CO5	L2	1.3.1

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B

MCA.II/04.25.005 Reg.No.

MCA DEGREE SECOND SEMESTER EXAMINATION, APRIL 2025

22-382-0205 DATA BASE MANAGEMENT SYSTEMS

(Regular)

Answer any FIVE questions.
(Each Question Carries 10 Mark)

Time : 3 Hours **Maximum Marks : 50**

Q.No		QUESTIONS	MARKS	CO	BL	PL
1	a.	With the help of a diagram, illustrate how the three-schema architecture separates user views from physical storage.	3	CO1	L2	1.7.1
	b.	In a hospital management system, the hospital maintains data about patients and the doctors they are assigned to. Each patient is admitted under a specific doctor, while a doctor can treat multiple patients. The system records details about each patient such as their name, age, and disease, and maintains doctor details like name and specialization. Design an Entity-Relationship (E-R) diagram to represent the above scenario. Your answer should include the following: 1. Identify and draw the entity sets for patients and doctors, including all relevant attributes. 2. Show the relationship between the entities, clearly indicating the mapping cardinality. 3. Indicate the type of attributes (e.g., simple, composite, derived) where applicable. 4. Mention the key attributes for each entity.	7	CO1	L3	1.7.1
		OR				
2	a.	An online bookstore stores data about books, authors, and publishers. A book can have multiple authors, but each author may write many books. Each book is published by only one publisher. The bookstore stores the following details: • Books: BookID, title, price, genre • Authors: AuthorID, name, email • Publishers: PublisherID, name, contactNumber Construct the E-R diagram showing all entities and relationships. Identify the attribute types and mapping cardinalities.	6	CO1	L3	1.7.1
	b.	Explain the types of attributes in the E-R model. Differentiate between simple, composite, derived, and multivalued attributes with examples.	4	CO1	L2	1.7.1

3	a.	Explain the various types of functional dependencies.	5	CO2	L2	1.7.1
	b.	Illustrate how nested queries are used with the IN, EXISTS, and ANY operators by providing suitable examples for each.	5	CO2	L2	1.7.1
		OR				
4	a.	You are tasked with designing a database for a university course registration system. The table, REGISTRATION *(StudentID, StudentName, CourseID, CourseName, InstructorName, Instructor Phone)* has the following dependencies. ● StudentID → StudentName ● CourseID → CourseName ● CourseID → InstructorName, InstructorPhone 1. Identify the candidate keys. 2. Determine which normal form the table satisfies. 3. Normalize the table to 3NF with explanation.	5	CO2	L3	1.7.1
	b.	Consider a relation schema R(A,B, C, D) with functional dependencies A→BC,C→AB,D→A. Check whether it is in 3NF or not?	5	CO2	L3	1.7.1
5	a.	A ticket reservation system handles multiple transactions such as booking tickets, cancelling reservations, checking seat availability, and updating passenger details. These transactions frequently access and modify shared data like seat availability and booking records. During peak hours or special events, many users try to book tickets at the same time. 1. Identify the potential concurrency problems that may arise in this ticket reservation system. 2. Suggest an appropriate concurrency control strategy to ensure data consistency and prevent booking conflicts during high-traffic periods.	8	CO3	L3	1.7.1
	b.	Define ACID properties.	2	CO3	L2	1.7.1
		OR				

6	a.	Consider the following schedule S involving three transactions T1, T2, and T3: T1: R(A) W(A) C T2: R(A) W(A) C T3: R(B) W(B) C (R-Read, W-Write, C- Commit) 1. Draw the precedence graph for the given schedule. 2. Is the schedule conflict serializable? Justify your answer. 3. Is the schedule recoverable? If not, explain why and how it can be made recoverable.	7	CO3	L3	1.7.1
	b.	Differentiate between shared lock and exclusive lock.	3	CO3	L2	1.7.1
7		What is clustering in file organization? How does it improve performance? Describe the benefits and limitations of clustering records in files.	10	CO4	L2	1.7.1
		OR				
8		Discuss how records are organized in files. Compare heap files, sequential files, and hash files in terms of structure, performance, and use cases.	10	CO4	L2	1.7.1
9	a.	Assume that an "employees" collection contains the following fields: name, salary, status, and department. Perform the following operations: a) Update the collection to add a bonus field for all employees whose salary is greater than 50,000. b) Delete all employees from the collection whose status is "resigned".	7	CO5	L3	1.7.1
	b.	What is NoSQL? List any two key features that distinguish NoSQL databases from traditional relational databases.	3	CO5	L3	1.7.1

		OR				
10	**a.**	Assume that the following documents are in the collection Book. • { title: "Mongo Basics", author: "John Smith", price: 300, stock: 10 } • { title: "Advanced Mongo", author: "John Smith", price: 450, stock: 0 } • { title: "Mongo Guide", author: "Jane Doe", price: 350, stock: 0 } Write and explain MongoDB queries to perform the following on a "books" collection: a) Update the price of all books by a specific author. b) Delete all books that are out of stock.	**6**	**CO5**	**L3**	**1.7.1**
	b.	How are documents deleted in MongoDB? Explain the usage of deleteOne() and deleteMany() methods with proper syntax and examples. Also mention how deletion based on a condition is performed.	**4**	**CO5**	**L3**	**1.7.1**

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