

Enrol. No.

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Regn. No.

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END SEMESTER EXAMINATION, JUNE- 2025
MCA Semester - II

Course Name: Operating Systems**Course Code: MCA124****Time allotted: 03 Hours****Max. Marks: 100****Note: Read all the instructions carefully.****Q.1. Attempt all.****(10×2=20)**

QN	Questions	CO	PO
a.	What is Belady's Anomaly?	1	2
b.	Describe the actions taken by a kernel to context-switch between processes.	2	1
c.	What are advantages of Multiprogramming?	3	2
d.	Define external fragmentation?	2	2
e.	What is Thrashing?	2	1
f.	Name some classic problem of synchronization?	2	2
g.	Give the condition necessary for a deadlock situation to arise?	2	1
h.	What is the sequence of operation by which a process utilizes a resource?	3	2
i.	What is Virtual Machine?	2	2
j.	What are the features of Linux file system?	2	1

Q.2. Attempt any five out of Seven.**(5×4=20)**

QN	Questions	CO	PO
a.	Explain kernel structure in UNIX.	1	2
b.	Explain the Access metrics mechanism.	2	1
c.	Explain various Disk Scheduling Algorithms with illustration.	3	2
d.	Explain swapping in memory management.	2	2
e.	What is Deadlock? Explain Deadlock prevention & Avoidance.	2	1
f.	Explain: Race conditions, Semaphore and Monitor.	2	2
g.	Explain the Process State transition diagram.	2	1

P.T.O./-

Q.3. Attempt any three out of four.

(3×10=30)

QN	Questions	CO																		
a.	I. What is the average waiting time and average turnaround times of all processes for FCFS, SJF algorithm? <table border="1"> <thead> <tr> <th>Processes</th><th>Burst</th><th>Time Priority</th></tr> </thead> <tbody> <tr> <td>P1</td><td>10</td><td>3</td></tr> <tr> <td>P2</td><td>1</td><td>1</td></tr> <tr> <td>P3</td><td>2</td><td>3</td></tr> <tr> <td>P4</td><td>1</td><td>4</td></tr> <tr> <td>P5</td><td>5</td><td>2</td></tr> </tbody> </table> II Explain different operations performed by the operating system. III Write the principles of protection?	Processes	Burst	Time Priority	P1	10	3	P2	1	1	P3	2	3	P4	1	4	P5	5	2	2
Processes	Burst	Time Priority																		
P1	10	3																		
P2	1	1																		
P3	2	3																		
P4	1	4																		
P5	5	2																		
b.	I. Explain Different Operations Performed by the Operating Systems? II. Explain LRU page replacement algorithm with a neat example.	2																		
c.	I. Distinguish among following terminologies i) Multiprogramming systems ii) Multitasking Systems iii) Multiprocessor systems. II. Describe the actions taken by a kernel to context-switch between kernel- level thread.	3																		
d.	I. Explain in detail about Inter Process Communication with examples. II. Consider the reference stream 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6. How many page faults while using FCFS and LRU using 2 frames? III. What are the five major activities of an operating system in regard to process Management.	3																		

Q.4. Attempt any two out of three.

(2×15=30)

a.	I. Explain essential features of following structure of O.S a) Monolithic System b) Layered Systems c) Micro Kernels d) Client Server Model e) Virtual Machines f) Exokernels II What are critical sections? Why mutual exclusion required? Explain any 2 methods of achieving mutual exclusion in detail.	2	1																												
b.	Consider the following snapshot of a system: <table border="1"> <thead> <tr> <th></th><th>ALLOCATION</th><th>MAX</th><th>AVAILABLE</th></tr> <tr> <th></th><th>A B C D</th><th>A B C D</th><th>A B C D</th></tr> </thead> <tbody> <tr> <td>PO</td><td>0 0 1 2</td><td>0 0 1 2</td><td>1 5 2 0</td></tr> <tr> <td>P1</td><td>1 0 0 0</td><td>1 7 5 0</td><td></td></tr> <tr> <td>P2</td><td>1 3 5 4</td><td>2 3 5 6</td><td></td></tr> <tr> <td>P3</td><td>0 6 3 2</td><td>0 6 5 2</td><td></td></tr> <tr> <td>P4</td><td>0 0 1 4</td><td>0 6 5 6</td><td></td></tr> </tbody> </table> ANSWER THE FOLLOWING QUESTIONS USING BANKER'S ALGORITHM: I. What does the content of the matrix need? II. Is the system in a safe state? III. If a request from process p1 arrives for (0 4 2 0) can the request be granted immediately?		ALLOCATION	MAX	AVAILABLE		A B C D	A B C D	A B C D	PO	0 0 1 2	0 0 1 2	1 5 2 0	P1	1 0 0 0	1 7 5 0		P2	1 3 5 4	2 3 5 6		P3	0 6 3 2	0 6 5 2		P4	0 0 1 4	0 6 5 6		3	2
	ALLOCATION	MAX	AVAILABLE																												
	A B C D	A B C D	A B C D																												
PO	0 0 1 2	0 0 1 2	1 5 2 0																												
P1	1 0 0 0	1 7 5 0																													
P2	1 3 5 4	2 3 5 6																													
P3	0 6 3 2	0 6 5 2																													
P4	0 0 1 4	0 6 5 6																													
c.	I. Process P1,P2,P3,P4 having arrival time of 0,1,5,6 microseconds and burst time 2,2,3,4 microseconds, draw Gantt chart and calculate average turnaround time, average waiting time ,average response time, CPU utilization and throughput using FCFS. II. What are the methods for handling deadlock and explain deadlock avoidance using resource allocation graph?	3	2																												

03/02

Enrol. No. **S R H U**

Regn. No. **D D**

END SEMESTER EXAMINATION, JUNE- 2025

MCA Semester - II

Course Name: OOP using Java

Course Code: MCA123

Time allotted: 03 Hours

Max. Marks: 100

Note: Read all the instructions carefully.

Q.1. Objectives Type (Very short) Attempt all.

(10×2=20)

a.	Write java features.	CO1	PO1,4
b.	Define Array	CO1	PO1,4
c.	<pre> class Q { public static void main(String arg[]) { StringBuffer s={"A","B"}; System.out.println(s[0]+" "+s[1]); } } </pre>	CO3	PO1,2
d.	Write the Class Level access specifiers.	CO2	PO1,4
e.	Define String Builder class with example?	CO3	PO1
f.	What is exception? Can we have finally with try block and without catch?	CO4	PO1,2
g.	Define Applet?	CO4	PO1,4
h.	Predict the error/output with reason <pre> public class Q { public static void main(String[] args) { boolean t1 = true, t2 = false, t3 = t1; boolean t = false; t &&= (t1 (t2 && t3)); System.out.println(t); } } </pre>	CO1	PO1,2
i.	What is Thin Driver?	CO5	PO1,2,3
j.	Define Garbage Collector.	CO5	PO1,4

Q.2. Short notes Type (Attempt any five out of Seven)

(5×4=20)

a.	Define constructor with its characteristics. Also write a code to overload the constructor.	CO1	PO1,3
b.	c. Write a program to implement the following interface: <pre> Interface i{ int reverseofanumber(int number); String reverseofastring(String str); } </pre>	CO2	PO1,3
d.	Write a code to implement four methods of String Class.	CO3	PO1,3
e.	Define JDBC and write a code to show the connectivity only.	CO5	PO1,3,4
f.	Explain GridLayout manager with a program code.	CO4	PO1,4
g.	Write a program to read a file and show its all content on console.	CO3	PO1,3

P.T.O./-

Q.3. Structured Question (Attempt any three out of four)

(3×10=30)

a.	(i) Create user define exception and also throw it by creating a proper situation (ii) Differentiate between throw and throws	CO4	PO1
b.	What is Inheritance, Explain different types of inheritance supported by Java with an example?	CO2	PO1,3,4
c.	(i) What is JDBC (ii) Discuss the drivers in JDBC	CO5	PO1,4
d.	Write a program to return factorial of a given number by using a non static parametric method	CO1	PO1,3

Q.4. Long Answer type (Attempt any two out of three)

(2×15=30)

a.	(i) Define Abstract Window Toolkit, discuss it with example? (ii) Differentiate between Character Oriented and Byte Oriented Streams	CO4,3	PO1,2,4
b.	Write the code to perform the following operations in java Swing: i) To get the name of selected text from textbox. ii) To set the password iii) To enable/disable the text field. iv) To set the text to a label v) To add a listener on a button	CO5	PO1,3
c.	(i) What is Thread? and how it is different from Process, write a code to implement it in java. (ii) Explain package in detail with example.	CO2	PO1,4

Enrol. No. **S R H U**Regn. No. **D D**

END SEMESTER EXAMINATION, JUNE- 2025

MCA Semester – II

Course Name: Data Base Management Systems**Course Code: MCA121**

Time allotted: 03 Hours

Max. Marks: 100

Note: Read all the instructions carefully.

Q.1. Attempt all.**(10×2=20)**

QN	Questions	CO	PO
a.	Define super key using appropriate example.	CO2	PO1
b.	Differentiate between Where and having clause in sql.	CO3	PO1,2
c.	Define DML commands of sql.	CO3	PO1
d.	What is a non-serial schedule?	CO5	PO1
e.	What do you mean by relation?	CO2	PO1
f.	Define view.	CO3	PO1
g.	List aggregate functions supported by SQL.	CO3	PO1
h.	What do you mean by multi valued dependency?	CO4	PO1,2
i.	Define DBMS.	CO1	PO1
j.	What do you mean by concurrent transaction?	CO1	PO1

Q.2. Attempt any five out of Seven.**(5×4=20)**

QN	Questions	CO	PO
a.	What do you mean by 3NF? Explain with an example.	CO3	PO1
b.	What do you mean by log-based recovery? Explain.	CO5	PO1,2
c.	What is cross product? Explain with the help of example.	CO2	PO1,2
d.	What do you mean by concurrent transaction? Explain with an example.	CO5	PO1,3
e.	What do you mean by two phase locking? Why we use?	CO5	PO1,3
f.	Explain view Serializability with an example.	CO5	PO1
g.	Let R = (A, B, C, D, E, F) be a relation scheme with the following dependencies- C → F, E → A, EC → D, A → B. Find candidate key for R?	CO4	PO1,2

P.T.O/-

Q.3. Attempt any three out of four.

(3×10=30)

QN	Questions	CO	PO
a.	Explain the following terms – (5+5) (i) What do you mean by inner join and outer join? Write SQL syntax. (ii) Why Primary key constraints are important? Explain with employee & Dependent table.	CO3 CO2	PO1,2 PO1,2
b.	Write a Short notes on - (3+3+4) (i) Atomicity in Transaction (ii) Network Model in Database (iii) Database Abstraction	CO5 CO1 CO1	PO1 PO1 PO1
c.	Attempt all. (5+5) (i) List and discuss the Armstrong rule for functional dependencies. Give relevant example (ii) Write in details about concept & types of keys in DBMS.	CO4 CO2	PO1 PO1
d.	What do you mean by constraints? Describe SQL execution of various constraints with example. (10)	CO3	PO1,2,3

Q.4. Attempt any two out of three.

(2×15=30)

QN	Questions	CO	PO
a.	(i) What do you mean by DBMS? Give advantages of DBMS over file processing system. (ii) Consider the below transaction. is the transaction being conflict serializable? Justify your answer. S: R2(X), W3(X) C, W1(X) C, W2(Y), R2(Z) C, R4(X), R4(Y) C	CO1 CO5	PO1 PO1 2 2
b.	(i) Discuss the Decomposition in a relation? Write the process of checking a loss less join decomposition. (ii) What is a Schedule? Write differences between serial and serializable Schedule.	CO4 CO5	PO1 PO1 2,3
c.	(i) Design an ER diagram for three entities named Doctor, Patient & Test, their attributes and relationship among them. (ii) Explain various type of relational algebra operation from set theory with example.	CO2 CO2	PO1 PO1 2,3

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END SEMESTER EXAMINATION, JUNE- 2025

MCA Semester – II

Course Name: Data Structure Using 'C'

Course Code: MCA122

Time allotted: 03 Hours

Max. Marks: 100

Note: Read all the instructions carefully.

Q.1. Attempt all.

(10×2=20)

a.	Define data structure.	CO1	PO1
b.	Explain the concept of multidimensional arrays.	CO1	PO1
c.	Given a 1-D integer array of 5 elements. Say the base address is 900. Find the address of 4th element.	CO1	PO2
d.	What is the time complexity of inserting an element into an array at the end.	CO1	PO3
e.	What is complexity of merge sort.	CO5	PO2
f.	Define heap.	CO4	PO2
g.	Define complete binary tree.	CO4	PO1
h.	Define graph.	CO4	PO1
i.	Define level and height of a tree.	CO4	PO2
j.	LIFO stands for....	CO2	PO2

Q.2. Attempt any five out of Seven.

(5×4=20)

a.	Write an algorithm to perform PUSH and POP operations on stack.	CO2	PO3
b.	Define queue. Explain insertion and deletion in a queue.	CO3	PO3
c.	Explain asymptotic notations used for the time complexity. Describe worst case, best case and average case time complexity.	CO1	PO2
d.	Explain Linked list and its types.	CO3	PO1
e.	Construct binary search tree for the given list of numbers. 4, 3, 7, 5, 2, 6, 8	CO4	PO2
f.	Explain various dynamic memory allocation functions available in C with their syntax and example.	CO2	PO2
g.	Convert following postfix expression into infix expression: ABC+-D*EF+\$	CO2	PO2

Q.3. Attempt any three out of four.

(3×10=30)

a.	Explain the Infix, Prefix and Postfix notations. Convert the given Infix expression to Prefix expression using Stack and show the details of Stack at each step of conversion. Expression: $A^((B+C)*(D+E)+F/G)$. Note: ^ indicates exponent operator.	CO2	PO2
b.	Explain linked list and its types. Write an algorithm and C function for deleting a node from the beginning of a singly linked list.	CO3	PO3
c.	What is heap tree? Explain its types. Sort the following values using heap sort. 5, 21, 15, 9, 2, 18, 10.	CO4	PO2
d.	What is Queue? Why it is known as FIFO? Write an algorithm to insert and delete an element from a simple Queue	CO2	PO3

Q.4. Attempt any two out of three.

(2×15=30)

a.	Explain complete, extended and full binary tree with suitable example. Also explain the preorder, postorder and Inorder tree traversals. Draw & evaluate the following expression using the expression tree. $3*4+10*2-6+5$	CO4	PO2
b.	List out various sorting algorithms. Explain merge and quick sort. Sort the following elements using merge sort. 48, 29, 8, 59, 72, 88	CO5	PO2
c.	Explain binary search tree. Construct binary search tree for the given list of numbers. 45, 38, 77, 55, 33, 66, 88, 22, 57, 89, 99, 46 Write an algorithm to insert an element in binary search tree.	CO4	PO3

END SEMESTER EXAMINATION, JUNE- 2025

MCA Semester - II

Course Name: Theory of Automata

Course Code: MCA125

Time allotted: 03 Hours

Max. Marks: 100

Note: Read all the instructions carefully.

Q.1. Objectives Type

(Very short/ Short Answer, MCQ, One-liners, Fill in the Blank, True/ False) Attempt all.

(10×2=20)

a.	Construct a finite automaton for the regular expression $(0+1)^*$	CO1	PO1,PO2
b.	What is traceable problem?	CO5	PO1,PO2
c.	What do you mean by Moore machine?	CO1	PO1,PO2
d.	Classify some closure properties of CFL.	CO2	PO1,PO2
e.	Explain finite automata.	CO1	PO1,PO2
f.	Define Ambiguous grammar.	CO2	PO1,PO2
g.	Differentiate Moore and Miley machine?	CO1	PO1,PO2
h.	Explain recursively enumerable language.	CO4	PO1,PO2
i.	Differentiate the + closure and * closure.	CO1	PO1,PO2
j.	Define Turing machine.	CO4	PO1,PO2

Q.2. Short notes / Short Answer Type (Attempt any five out of Seven)

(5×4=20)

a.	Differentiate between leftmost and rightmost derivations.	CO2	PO1,PO2,PO3
b.	Explain how a TM can be used to determine the given number is prime or not.	CO4	PO1,PO2,PO3
c.	Expand Chomsky Classification of language taking suitable example of each classification.	CO2	PO1,PO2,PO3
d.	A PDA is more powerful than a finite automaton. Justify this statement.	CO3	PO1,PO2,PO3
e.	Remove the unit production from the grammar $S \rightarrow AB, A \rightarrow E, B \rightarrow C, C \rightarrow D, D \rightarrow b, E \rightarrow a$	CO2	PO1,PO2,PO3
f.	Difference between DFA and NFA with their State transition diagram.	CO1	PO1,PO2,PO3
g.	Design a TM to accept the language $L = \{0^n 1^n \mid n \geq 1\}$	CO4	PO1,PO2,PO3

P.T.O./-

Q.3. Structured Question (Attempt any three out of four)

(3×10=30)

a.	Minimize the following finite automata.	CO1	PO1,PO2,PO3
	<pre> graph LR a((a)) -- 0 --> b((b)) b -- 1 --> a a -- 1 --> c((c)) b -- 1 --> d((d)) c -- 0 --> d c -- 1 --> e((e)) d -- 1 --> f((f)) e -- 1 --> f f -- "0,1" --> f e -- 0 --> e style a fill:#fff,stroke:#000,stroke-width:1px style b fill:#fff,stroke:#000,stroke-width:1px style c fill:#fff,stroke:#000,stroke-width:1px style d fill:#fff,stroke:#000,stroke-width:1px style e fill:#fff,stroke:#000,stroke-width:1px style f fill:#fff,stroke:#000,stroke-width:1px linkStyle 0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99 stroke:#000,stroke-width:1px </pre>		
b.	Convert the following grammar into Greibach normal form. $S \rightarrow AA/a$ $A \rightarrow SS/b$	CO2	PO1,PO2,PO3
c.	Construct an equivalent PDA for the following CFG $S \rightarrow aAB \mid bBA$ $A \rightarrow bS \mid a$ $B \rightarrow aS \mid b$	CO3	PO1,PO2,PO3
d.	From the identities of RE, prove that 1. $10+(1010)^*[^(1010)^*]=10+(1010)^*$ 2. $(0+011^*)+(0+011^*)(01+0100^*)(01+0100^*)^*=01^*(010^*)^*$	CO1	PO1,PO2,PO3

Q.4. Long Answer / Essay type (Attempt any two out of three)

(2×15=30)

a.	Explain the concept of NP-hardness and its significance in computational complexity theory. Provide an example of an NP-hard problem and discuss why it is classified as such.	CO5	PO1,PO2,PO3
b.	Construct a CFG equivalent to the following PDA. $PDA = \{(p, q), (0, 1), \delta, p, q, (Z, X)\}$, where p is initial state, q is final state. δ is defined as $\delta(p, 0, Z) = (p, XZ)$, $\delta(p, 0, X) = (p, XX)$, $\delta(p, 1, X) = (q, \epsilon)$, $\delta(p, 1, Z) = (p, \epsilon)$, $\delta(p, \epsilon, Z) = (p, \epsilon)$.	CO3	PO1,PO2,PO3
c.	Simplify the following context free grammar. (Here, Λ stands for epsilon (ϵ)). $S \rightarrow TU \mid V$ $T \rightarrow aTb \mid \Lambda$ $U \rightarrow cU \mid \Lambda$ $V \rightarrow aVc \mid W$ $W \rightarrow bW \mid \Lambda$	CO2	PO1,PO2,PO3

END SEMESTER EXAMINATION, JUNE- 2025**MCA Semester – II****Course Name: Network Security and Cryptography****Course Code: MCE123**

Time allotted: 03 Hours

Max. Marks: 100

Note: Read all the instructions carefully.

Q.1. Attempt all.**(10×2=20)**

QN	Questions	CO	PO
a.	Write down the security services which protect our security goals.	1	1,2
b.	Calculate $\phi(128)$.	2	1,2
c.	What is Triple DES?	1	1,2
d.	Calculate $5^{15} \bmod 13$.	2	1,2
e.	What is ECC?	3	1,2
f.	What is the Nested MAC?	3	1,2
g.	What is Data Encryption? Why it is important in network security?	4	1,2
h.	Write down the services provided by SSL.	5	1,2
i.	Write the definition of Chinese remainder theorem.	3	1,2
j.	Discuss few Active attacks which violate Integrity	1	1,2

Q.2. Attempt any five out of Seven.**(5×4=20)**

QN	Questions	CO	PO
a.	What is substitution cipher? Encryption plain text "charli eats mango" using vigenere cipher using key "fruit".	1	1,2
b.	Explain SSH and how it is different from SSL.	3	1,2
c.	Find out the secret key and y, when the value of $p=71$, $g=7$, $x=5$, $y=?$	3	1,2
d.	Explain Intrusion Detection System.	5	1,2
e.	Apply RSA algorithm to encrypt a message $M=5$, where $p=7$ and $q=13$.	4	1,2
f.	Discuss the issues and challenges in security in mobile and wireless computing?	4	1,2
g.	For the group $G=\langle \mathbb{Z}_{19}^*, x \rangle$, find the order of each element in the group.	2	1,2

Q.3. Attempt any three out of four.**(3×10=30)**

QN	Questions	CO	PO
a.	i. What is a block cipher? And also write the rules of Play Fair Cipher used for encryption. ii. What do you mean by fermat's theorem, also find the following based on the fermat's theorem: a. $5^{-1} \bmod 23$ b. $71^{-1} \bmod 100$	1,2	1,2
b.	i. Explain ElGamal Algorithm ii. Explain in detail about Chinese remainder theorem. Solve for x, the following set of equations: $x \equiv 2 \pmod{3}$; $x \equiv 3 \pmod{5}$; $x \equiv 2 \pmod{7}$	3,2	1,2
c.	i. Write and explain the digital signature algorithm. ii. Explain in detail Hash Functions.	3,4	1,2
d.	i. Define Firewall. Point out the characteristics of the firewall. ii. What is MIME? What is S/MIME? Explain the security services.	5	1,2

Q.4. Attempt any two out of three.**(2×15=30)**

QN	Questions	CO	PO
a.	i. Define KDC and its need? ii. What do you mean by Intrusion Detection System, Explain?	5,4	1,2,3
b.	Explain the following with examples: a. Confidentiality b. Integrity c. Availability	1	1,2
c.	i. Use Affine Cipher to encrypt the message "Honesty is the best policy" using key (7,9) ii. Define Social Engineering Attack	2, 5	1,2
