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II Semester M.C.A. Degree Examination, December - 2023
COMPUTER SCIENCE
The Design and Analysis of Algorithm
(CBCS Scheme Y2 K20)
Paper : 2MCA5

Time : 3 Hours**Maximum Marks : 70****Instructions to Candidates**

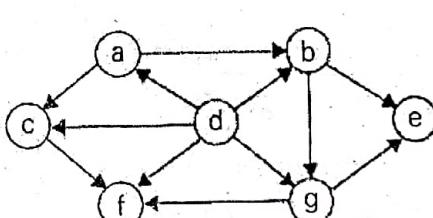
Answer any Five questions from Part - A and any Four questions from Part - B.

PART - A

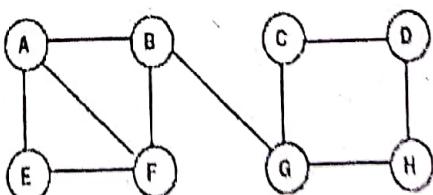
Answer any FIVE questions . Each question carries 6 marks.

(5×6=30)

1. Define algorithm. What are the criteria that an algorithm must satisfy?
2. Design an algorithm for performing sequential search and compute the best case, worst case and average case efficiency.
3. Apply quick sort algorithm to sort the list 4,1,3,2,7,6,5,8 in ascending order. Justify that the given instance is an example for best case.
4. Define topological sorting. Apply Source Removal method to obtain Topological sort for the given graph:



5. Traverse the following graph using Depth-First Search method. Write the order of traversal





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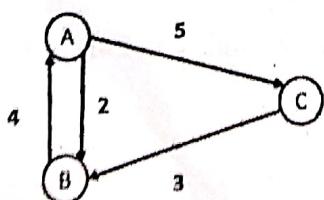
6. Present dynamic programming-based algorithm for computing binomial coefficient and analyse efficiency. Find 5C_3 .
7. Explain how space and time trade off can be achieved by input enhancement in Horspool string matching algorithm. Demonstrate using a suitable example.
8. Explain P, NP and NP Complete problems.

PART-B**Answer any Four questions. Each question carries 10 marks.** $(4 \times 10 = 40)$

9. a) Write an algorithm to find the maximum element in an array of n elements. Give the mathematical analysis of this non recursive algorithm. $(5+5)$
b) Explain the general plan for analysing the efficiency of a recursive algorithm. Write the algorithm to find a factorial of a given number. Derive its efficiency.
10. a) Apply bottom-up dynamic programming algorithm to the following instance of knapsack problem of capacity W=5kgs. (6)

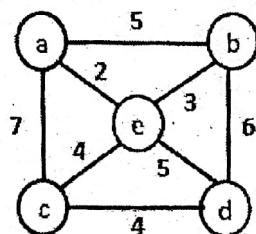
Item No.	Weight (kg)	Profit(Rs)
1	1	5
2	3	9
3	2	4
4	2	8

- b) Write brute force string matching algorithm. (4)
11. Define transitive closure of a directed graph. Write Warshall's algorithm and apply it to find the transitive closure of the digraph given below. (10)



12. a) Write the difference between backtracking and branch and bound. Solve 4 Queens problem. Construct a state space tree. $(5+5)$

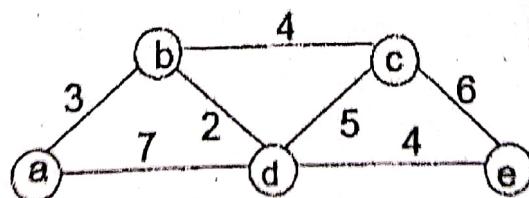
- b) With the help of a state space tree find a subset of a given set $S = \{3, 5, 6, 7\}$ of n positive integers whose sum is equal to a given positive integer $d=15$ using back tracking method.
13. a) Define minimum cost spanning tree. Write Prim's algorithm to find minimum cost spanning tree. (5+5)
- b) Apply Kruskal's algorithm to find the minimal cost spanning tree for the graph given.



14. a) Explain Huffman code and construct a Huffman tree for the following data using greedy technique. (5+5)

Symbol	A	B	C	D	-
frequency	0.4	0.1	0.2	0.15	0.15

- b) Using Dijkstra's method find the single source shortest-paths of the following graph applying greedy technique.





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II Semester M.C.A. Degree Examination December - 2023

COMPUTER SCIENCE

Artificial Intelligence

(CBCS Scheme : 2020-21 Y2 K20)

Paper : 2MCA6

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates

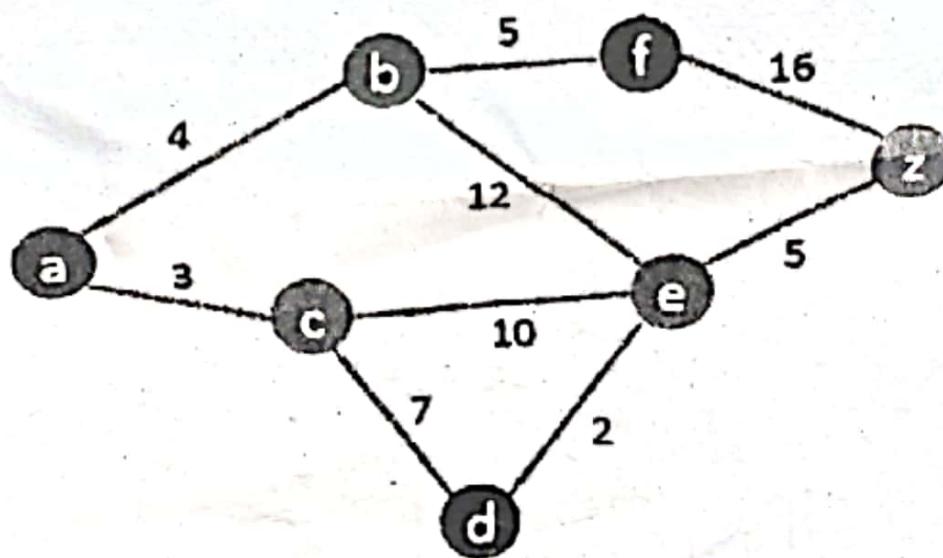
- 1) Answer any Five questions from Section - A
- 2) Answer any Four full questions from Section - B

SECTION-A

Answer any Five. Each question carries 6 marks.

(5×6=30)

1. What is a rational agent? Explain the structure of agents.
2. Solve the following using A* algorithm.



The Heuristics are as under:

a	14
b	12
c	11
d	6
e	4
f	11
g	0

[P.T.O.]



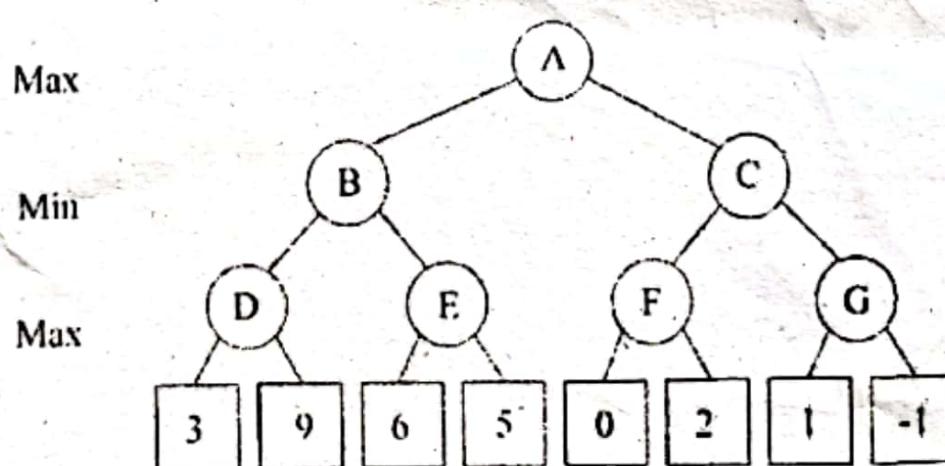
3. Compare the following:
- Forward Chaining v/s Backward Chaining.
 - Propositional logic v/s First Order Predicate logic.
4. Define knowledge-based agent. Explain Wumpus world problem.
5. Explain various forms of learning. How is explanation-based learning done?
6. Develop parse tree structure for the sentence "Jeevitha slept on the bench" by constructing your own grammar rules.
7. What is Expert system? Explain its architecture.
8. What is Natural Language processing? Explain its advantages and roles in AI.

SECTION-B

Answer any Four. Each question carries 10 marks.

(4×10=40)

9. a) What is Game Playing? Discuss Minimax search procedure with example (6)
- b) Explain on-line search agents in AI. (4)
10. a) Write a note on agent environments. (5)
- b) Solve the following Alpha-Beta pruning problem. (5)



11. a) Express the following using FOPL: (5)
- All birds except ostrich can fly.
 - Not all students like both Maths and Science.
 - Some children do not like chocolates.
 - Students who either work hard or are lucky pass the exams.
 - Not everyone believes in God.
- b) Discuss Strips and K-Strips in Plan generating systems. (5)



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12. Write short notes on: (5+5)
- a) Truth Maintenance Systems.
 - b) Heuristic functions.
13. a) Briefly discuss Fuzzy Logic. (4)
- b) What is robotics? Explain Robot Kinematics. (6)
- 14 Explain Syntactic processing, semantic analysis, discourse and pragmatics in Natural Language processing. (10)
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II Semester M.C.A. Degree Examination, December - 2023**COMPUTER SCIENCE****Computer Networks****(CBCS Y2K20 Scheme Non-NEP)****Paper :2MCA3****Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates:****Answer any Five questions from Section - A****Answer any Four questions from Section - B****SECTION-A****Answer any Five questions. Each question carries 6 marks.****(5×6=30)**

1. Define the term Data Communication. What are its characteristics? Explain its components.
2. Write a note on transmission impairment.
3. Differentiate between error detection and error correction with suitable example.
4. Compare and contrast Go-Back-N-ARQ and Stop-and-Wait ARQ.
5. Define ALOHA. Differentiate between Pure Aloha and Slotted Aloha.
6. What is IPv4? Discuss about classful addressing and classless addressing.
7. Explain about TCP congestion control.
8. Explain WWW in detail.

SECTION-B**Answer any Four questions . Each question carries 10 marks.****(4×10=40)**

9. a) Explain the layers of TCP/IP protocol suite in detail. (6)
b) Discuss the different types of computer networks. (4)



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10. a) What is Point-to-Point Protocol? Explain. (6)
b) Write a note on Polling and token passing. (4)
11. Define Channelization. Explain different channelization protocols. (10)
12. a) Write a note on ICMP. (5)
b) What is three-way handshaking in TCP. (5)
13. Briefly explain User Datagram Protocol (UDP). List its uses. (10)
14. Explain in detail about Domain Name System. (10)



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II Semester M.C.A. Degree Examination, December - 2023**COMPUTER SCIENCE****Database Management Systems****(CBCS-Y2K20 Scheme)****Paper : 2MCA2****Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates:**

1. Answer All the Sections.
2. Answer any Five questions from Section - A
3. Answer any Four questions from Section - B

SECTION-A**Answer any Five questions. Each question carries 6 marks.****(5×6=30)**

1. Explain the characteristics of the database approach.
2. What is relational schema and relational instance? Give one example of each.
3. What is an attribute? Explain the different types of attributes with an example.
4. Draw an ER diagram for the Bank database with four entities having six attributes each.
5. Write a note on different types of indexes.
6. Explain with illustration UNION, INTERSECTION and SET DIFFERENCE operations in relational algebra.
7. What are different types of constraints in SQL? Explain with illustration.
8. Explain two-phase locking with an example.

SECTION-B**Answer any Four questions . Each question carries 10 marks.****(4×10=40)**

9. a) Explain the three-schema architecture with a neat diagram. (6)
b) What do you mean by actors on the scene and workers behind the scene? Explain. (4)



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10. a) Define the following terms with example: (6)
i) Domain
ii) Cardinality
iii) Foreign key
b) Explain the different types of joins in relational algebra. (4)

11. Given the relation and the functional dependencies, normalize upto first two normal forms (FNF and 2NF). (10)

EMP_PROJ (ssn, empname, bdate, dept_no, proj_id, proj_name, proj_hrs)

Functional Dependencies:

$\{ssn\} \rightarrow \{empname, bdate, dept_no, proj_id\}$

$\{proj_id\} \rightarrow \{proj_name\}$

$\{proj_id, ssn\} \rightarrow \{proj_hrs\}$

Please Note: Each employee can work on more than one project. He works for a specific number of hours on each project.

12. a) Explain any five aggregate functions in SQL with an example. (5)
b) What are views? Give advantages and disadvantages of views. (5)

13. a) Given the Library Database: (5)

Student (usn, name, address)

Book (book_id, bookname, author_id, publisher)

Author (auhthor_id, authortname, country)

Borrow (usn, book_id, borrowed_date)

Answer the following:

- i. Display the student name along with names of the books borrowed by them.
ii. Add the column email_id for the Student table.
iii. List the books that have not been borrowed at all.
iv. Display the number of books published by each author.
v. Display the number of books issued by each student.
b) What is a transaction? Explain ACID properties of transaction. (5)
14. a) Explain Log based recovery techniques. (5+5)
b) Write a note on embedded SQL.



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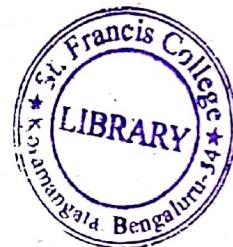
II Semester M.C.A. Degree Examination, December - 2023**COMPUTER SCIENCE****Operating Systems****(CBCS-Y2K20 Scheme)****PAPER : 2 MCA1****Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates****Answer any Five questions from Section - A****Answer any Four questions from Section - B****SECTION-A****Answer any Five questions. Each question carries 6 Marks.****($5 \times 6 = 30$)**

1. Explain the services of operating system.
2. Define process. Explain the states of process.
3. What is system call? Explain types of system calls.
4. What is deadlock? Explain the necessary conditions for deadlock to occur.
5. Write a short note on real time CPU scheduling.
6. A system uses 3 page frames for storing process pages in main memory. It uses LRU page replacement policy. Assume that all the page frames are initially empty. What is the total number of page faults that will occur while processing the page reference string given below? 4, 7, 6, 1, 7, 6, 1, 2, 7, 2
7. Explain various techniques of disk management mass storage structure.
8. Explain the implementation of Access matrix.

SECTION-B**Answer any Four questions . Each question carries 10 Marks.****($4 \times 10 = 40$)**

9. a) What is operating system? Explain the different types of operating systems. (6)
b) Write a note on multithreading. (4)

[P.T.O.]



10. a) Consider the following set of processes with given burst time. Draw the Gantt chart and find average waiting time using (6)

- i) FCFS
- ii) Preemptive SJF

Process	P1	P2	P3	P4	P5
Burst time	6	2	8	3	4
Arrival time	2	5	1	0	4

- b) Write a short note on semaphores. (4)

11. Consider the following and check whether the system is safe or not using Bankers algorithm. Determine the sequence in case it is safe.

Processes	Allocation			MAX			Available		
	A	B	C	A	B	C	A	B	C
P ₀	0	1	0	7	5	3	3	3	2
P ₁	2	0	0	3	2	2			
P ₂	3	0	2	9	0	2			
P ₃	2	1	1	2	2	2			
P ₄	0	0	2	4	3	3			

(10)

12. a) Explain Readers - Writers problem for synchronization.
 b) Define thrashing . Illustrate different methods to prevent thrashing. (5+5)
13. a) What is File? Explain the file allocation methods. (6)
 b) Explain any two disk scheduling algorithms. (4)
14. a) What is domain protection? Explain with an example.
 b) What are virtual machines. Explain benefits of creating virtual machine. (5+5)



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II Semester M.C.A. Degree Examination, December - 2023**COMPUTER SCIENCE****Software Engineering****(CBCS Scheme Y2 K20)****Paper : 2MCA4****Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates:**

1. Answer any Five questions from Section - A
2. Answer any Four questions from Section - B

SECTION-A**Answer any FIVE questions, Each question carries 6 marks.****(5×6=30)**

1. Discuss the four core values of Agile manifesto.
2. What is use case diagram? Illustrate the interactions between actors and system for an ATM system.
3. Define refactoring. Explain how refactoring helps in agile development.
4. What is the purpose of using measures in software development projects? Explain various measures used in context of Agile software development.
5. What is Test Driven Development (TDD)? Explain how TDD fits into agile methodologies.
6. Write a short note on agile software development from constructivist perspective.
7. Explain the various abstraction levels in agile software development.
8. Explain retrospective facilitator, his roles and responsibilities in agile.

[P.T.O.]



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SECTION-B**Answer any FOUR questions. Each question carries 10 marks.** $(4 \times 10 = 40)$

9. a) Explain the role scheme in agile teams
- b) Discuss dilemmas and awards in teamwork $(5+5)$
10. a) Draw activity diagram for online order placement system. (6)
- b) What are the techniques used to ensure tightness of software projects? (4)
11. a) Briefly explain the agile approach to quality assurance. $(5+5)$
- b) Explain how agile software development supports learning process.
12. a) Write a note on the conceptual framework for change introduction.
- b) Discuss the role of short releases and iterations in learning process. $(5+5)$
13. a) Explain the agile approach in global software development.
- b) What roles do coach and mentor play in agile leadership and how does this benefit the team members? $(5+5)$
14. **Write short notes on:**
- a) Release Celebration
- b) Reflective sessions between releases $(5+5)$