

Reg No.: 2032 Name: _____

0520MCA102052201 APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Second Semester MCA (2 Year) Degree Examination June 2022

Course Code: 20MCA102

Course Name: ADVANCED DATABASE MANAGEMENT SYSTEMS

Max. Marks: 60

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- | | | |
|----|---|-----|
| 1 | List any three advantages of database management systems. | (3) |
| 2 | Given an ER model representing the binary relationship between two entity sets E_1 with attributes a (primary key), b , and c and E_2 with attributes x (primary key) and y , convert the model to relational model by forming a minimum number of relational schema in each of the following cases when the relationship between E_1 and E_2 is (a) one-to-one and (b) many-to-many. | (3) |
| 3 | What is meant by lossless decomposition of a relation? Give one example to illustrate. | (3) |
| 4 | Give one example of a relation which is in 3NF but not in BCNF. Justify your answer. | (3) |
| 5 | Write one example of a concurrent serializable schedule that involves two transactions T_1 and T_2 . Explain why it is serializable. | (3) |
| 6 | Explain how a deadlock situation can sometimes arise while using two phase locking protocol for concurrency control. | (3) |
| 7 | RAID provides high reliability and performance. Justify your answer. | (3) |
| 8 | List out and illustrate query evaluation strategies for selection operation. | (3) |
| 9 | Briefly describe the mechanisms used in distributing data among data storage. | (3) |
| 10 | Identify the difference between MongoDB and relational databases. | (3) |

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

- 11 FIFA wants to maintain data about various teams and matches played in the (6) World Cup Soccer tournament. Each team is identified by the country name, which is unique. Other attributes of a team are jersey color and current FIFA ranking, which is also unique. Each team has a number of players, one of whom is the captain. For each player, a player ID has to be maintained which is unique. Consider another two attributes of the player as you feel appropriate, one of which should be multi-valued. It is also required to maintain the details of the coach of each team like his name (which is unique across all teams), date of birth, and salary in dollars. For each match, the date of the match, names of the teams and the team that won the match should be maintained (Assume each match has a decisive score, i.e., no match is drawn) along with the final score (like 2-1, 1-0, etc.). For each player, we have to maintain the number of goals scored in different matches.

- (a) Draw an E-R diagram to represent the E-R model for the above situation. Clearly identify primary and candidate keys of entity sets, cardinality and participation.
- (b) Form the corresponding relational model clearly identifying primary and foreign keys. The number of relations should be minimum.

OR

- 12 Consider two relation schemas R(A, B) and S (B,C). Two relations are defined (6) on these schemas as $r(R)$ and $s(S)$.
- (a) Using the basic relational algebra operations select, project, union, set difference, cartesian product and rename (Note: You may or may not need all of these operations), write relational algebra expressions for: (i) Natural join $r \bowtie s$ and (ii) $\pi_B(r) \cap \pi_B(s)$.
 - (b) Illustrate the difference between inner join and outer join operations by using some instances of $r(R)$ and $s(S)$.

Module II

- 13 Given a relation schema R (ABCDEFGHIJ) with a set of FDs F = {AB→C, (6)
A→DE, B→F, F→GH, D→IJ }.
(a) Determine the key for R
(b) Decompose R into 2NF relations.

OR

- 14 Consider the following relational schema *Professor_Course(pid, cid, pname, poffice, pcode, cname, cred)*. Let a relation be defined on the schema to store information about professors who are assigned to teach different courses. A professor is described by a unique ID *pid*, name *pname*, postal name *poftenice*, and pincode *pcode* and a course is described by a unique course ID *cld*, course name *cname*, and course credit *cred*. Assume that a course can be taught jointly by more than one professor and one professor can teach more than one course in a semester. Normalize the above schema such that the normalized schema is in second normal form (2NF). Check whether the normalized schema is in third normal form (3NF). If not, obtain a normalization so that all schemas are in 3NF.

Module III

- 15 Consider the following set of three transactions: (6)
T1: r(x); r(z); w(x); w(y); w(z)
T2: r(z); r(y); w(z); w(x)
T3: r(x); r(y); w(y); w(z)

For the above three transactions, generate non-trivial (i.e., not serial unless that is the only way) serializable schedule using 2PL. Clearly identify the corresponding serial schedules and the conditions that determine the order of the equivalent serial schedules.

OR

16 Consider the three transactions T1, T2, and T3, and the schedules S1 and S2 given below. (6)

a. State whether each schedule is serializable or not.

b. For each serializable schedule, write down at least one possible equivalent serial schedule.

T1: r1(x); r1(z); w1(x)

S1: r1(x); r2(z); r1(z); r3(x); r3(y); w1(x); w3(y); r2(y); w2(z); w2(y)

S2: r1(x); r2(z); r3(x); r1(z); r2(y); r3(y); w1(x); w2(z); w3(y); w2(y)

Module IV

17 Briefly explain with the help of an example, the difference between B-Tree and B+ Tree indexing techniques. (6)

OR

18 Explain (a) Open hashing and (b) Closed hashing (6)

Module V

19 Explain the main features of replication and sharding of MongoDB? (6)

OR

20 What is CAP theorem? Explain. (6)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Second Semester MCA (2 Year) Degree Examination June 2022

Course Code: 20MCA104

Course Name: ADVANCED COMPUTER NETWORKS

Max. Marks: 60

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- | | | |
|----|--|-----|
| 1 | What are the reasons for using layered protocol architecture? | (3) |
| 2 | Differentiate HTTP persistent and non-persistent communications. | (3) |
| 3 | Demonstrate how Stop-and-Wait protocol is used for reliable data transfer. | (3) |
| 4 | Discuss about three-way handshaking in TCP with suitable diagram. | (3) |
| 5 | What are Virtual Circuits? Compare with circuit switched and packet switched networks. | (3) |
| 6 | Explain the features of RIP. | (3) |
| 7 | Draw and explain IEEE 802.3 Ethernet frame format. | (3) |
| 8 | What is the difference between a Hub and a Switch? | (3) |
| 9 | With a neat diagram explain the architecture of Bluetooth | (3) |
| 10 | What is VPN? | (3) |

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

- *11 What is the relevance of a network protocol architecture? With neat diagram, brief the responsibilities of network support layers in OSI Reference model? (6)

OR

- 12 Discuss with relevant example, the application layer protocol used to retrieve web pages from the Web. (6)

13 What is network congestion? Show how the performance of network is affected by congestion? Write about the mechanisms to alleviate congestion after it happens.

14 Demonstrate the working of Go-Back-N and Selective Repeat protocols with suitable diagrams.

OR

- 15 Define routing? Explain the process of Link State Routing with OSPF protocol. (6)
- 16 Write short notes on inter-domain routing protocol BGP. (6)

Module IV

OR

17 Explain the random access protocol used for collision detection in Ethernet. (6)

18 Generate codeword at sender and perform checking of codeword at receiver assuming no error for the dataword 1100 and divisor 1101 using CRC. (6)

Module V

OR

19 With neat diagram explain the architecture of IEEE 802.11 Wireless LAN. (6)

20 Explain SNMP framework for managing devices in the Internet. (6)

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0520MCA172072 Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Second Semester MCA (2 Year) Degree Examination June 2022

Course Code: 20MCA172

Course Name: ADVANCED OPERATING SYSTEMS

Max. Marks: 60

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- 1 What is a process. Discuss about different states of a process with diagram (3)
- 2 What is the concept of path expressions? Explain the purpose of the following path expressions: (3)
i) path read + write end
ii) path write; {read} end
- 3 Discuss the importance of mutual exclusion? What are the requirements of mutual exclusion algorithms? (3)
- 4 Discuss about the major features of access control list (3)
- 5 What is a distributed file system? What are its services? (3)
- 6 Explain how to implement distributed shared memory using the read replication algorithm. (3)
- 7 Explain the differences between UMA and NUMA architecture of multiprocessor systems. (3)
- 8 Explain any two interconnection networks for multiprocessor systems. (3)
- 9 Test the conflict serializability of the following log using serialization graph. (3)
- 10 Explain how timestamp establish a total ordering of transactions. (3)

$$L = \underline{r1(x)} \underline{r3(y)} \underline{w1(x)} \underline{w2(y)} \underline{r3(x)} \underline{w2(x)}$$

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

- 11 Explain why Lamport's logical clocks are important in distributed systems. (6)

OR

What are monitors' limitations in terms of mutual exclusion? How do serializers get around this? (6)

Module II
Demonstrate that the Ricart-Agrawala algorithm accesses the critical section in ascending sequence of timestamps. (6)

14 Explain Suzuki-Kasami's broadcast algorithm for mutual exclusion. (6)

Module III OR (6)

Explain the components of a load distributing algorithm. (6)

OR (6)

16 With a clear flowchart, explain the receiver-initiated load distribution algorithm in distributed systems (6)

Module IV OR (6)

Explain any three design issues of multiprocessor systems. (6)

OR (6)

18 Write short notes on : (3)

- a. Memory Virtualisation (3)
- b. Para Virtualisation (3)

Module V OR (6)

19 What is a two-phase locking scheme, and how does it work? What are the drawbacks of 2PL? (6)

20 Explain the Kung-Robinson concurrency control algorithm. (6)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Second Semester MCA (2 Year) Degree Examination June 2022

Course Code: 20MCA188

Course Name: ARTIFICIAL INTELLIGENCE

Max. Marks: 60

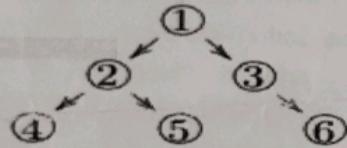
Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- 1 List major application areas in AI (3)
- 2 Explain the classes of production system. (3)
- 3 Define search tree and illustrate with an example. (3)
- 4 Consider the following graph: (3)



Starting at root node 1, give the order in which the nodes will be visited by the breadth-first and depth-first algorithms.

- 5 Explain the strategy of minimax algorithm. (3)
- 6 Why the alpha-beta pruning method is better than the minimax search method in solving a game? (3)
- 7 Explain the existential and universal quantifiers in First Order Logic. (3)
- 8 List components of a planning system. (3)
- 9 Discuss the roles of individuals who interact with expert system. (3)
- 10 Define a fuzzy set. (3)

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

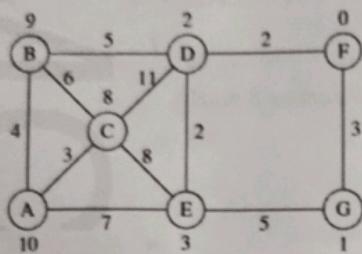
- 11 Explain the blocks world problem in AI. (6)

OR

12 Define production systems. Explain the components of a production system. (6)

Module II

13 Using the greedy best first search algorithm, find an optimal path from A to F in the search graph given below. In the figure, the numbers written alongside the nodes are the values of the heuristic function and the numbers written alongside the edges are the costs associated with the edges.



(6)

OR

14 Explain about admissible heuristic function with example. (6)

Module III

15 Explain alpha-beta pruning algorithm with an example. (6)

OR

16 Explain about Frames and Conceptual Dependency. (6)

Module IV

• 17 Explain resolution-refutation method in FOPL with an example. (6)

OR

18 Explain

a) Goal stack planning. (6)

b) Hierarchical planning

Module V

19 Illustrate the architecture of expert system and mention its features. (6)

OR

20 Define the set-theoretic operations for fuzzy sets with suitable examples. (6)

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0520MCA102052203
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Second Semester MCA (2 Year) Degree Examination June 2022

Course Code: 20MCA102

Course Name: ADVANCED DATABASE MANAGEMENT SYSTEMS

Max. Marks: 60

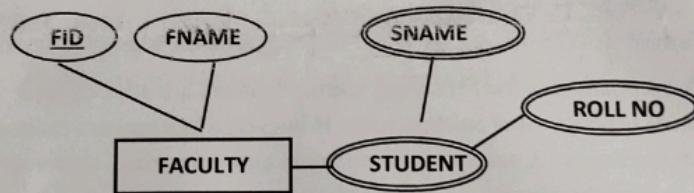
Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

1. Differentiate between instance and schema of a database. Give an example in the context of relational DB. (3)
2. Consider the following entity set FACULTY which gives faculty details along with details of students whose projects are guided by the faculty. Assuming that STUDENT is a multi-valued, composite attribute and that a student is guided by exactly one faculty member, show how the multi-valued attribute can be replaced by an additional entity and a relationship. (3)



3. Consider the relation R(A,B,C,D,E) with FDs, $A \rightarrow B$, $AB \rightarrow D$, $D \rightarrow E$, $BD \rightarrow C$. Check, using the attribute closure method, if A is a key of R. (3)
4. Convert the following table MOVIES to 1NF: (3)

MOVIE ID	TITLE	DIRECTORS	
		FName	LName
A1	Rambo	X	Y
		P	Q
D2	God Father	T	N
T5	Face Off	X	Y
		K	S

5. What is the importance of log in database recovery? (3)

- 6. How is the wait/die scheme for time-stamping different from the wait/wound scheme? (3)
- 7. Distinguish between RAID 2 and RAID 3 levels. (3)
- 8. How is dense index different from sparse index? (3)
- 9. How is sharding different from replication in the context of MongoDB? (3)
- 10. What are the desirable properties of distributed databases with replication? (3)

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

11. Study the following relational schema. Foreign keys have the *same* names as respective primary keys. (6)

*supplier(sid, sname, saddress)
part(pid, pname, pcolour)
project(jid, jname, jcost)
supplies(sid,pid,jid, quantity)*

Write relational algebra expressions for the following queries:

- Names of suppliers who supply parts to a project with name "Renovation".
- Names and quantity of parts supplied by the supplier "MyC&Co." to the project "Refurbishing"
- Names of suppliers who supply *no* part with colour "red".

OR

12. A company has the following scenario: There are a set of salespersons. Some of them manage other salespersons. However, a salesperson cannot have more than one manager. A salesperson can be an agent for many customers. A customer is managed by exactly one salesperson. A customer can place any number of orders. An order can be placed by exactly one customer. Each order lists one or more items. An item may be listed in many orders. An item is assembled from different parts and parts can be common for many items. One or more employees assemble an item from parts. A supplier can supply different parts in certain quantities. A part may be supplied by different suppliers. (6)

Identify and list entities, suitable attributes, primary keys, foreign keys and relationships to represent the scenario.

Module II

13. Consider a relation R(A,B,C,D,E,F,G) with A and CD as candidate keys. Assume that the following dependencies hold on R: $D \rightarrow FG$, $F \rightarrow G$, $C \rightarrow A$. Split R into the highest possible normal form quoting the reason for each step. (6)

OR

14. Given a relation M(P,Q,R,S,T,U) with FDs, $F = \{P \rightarrow R, PQ \rightarrow R, R \rightarrow SU, RS \rightarrow U, TR \rightarrow PQ\}$, compute the minimal cover of F. (6)

Module III

- 15 Illustrate the following problems with suitable examples (i) Lost-update problem (6)
(ii) Inconsistent Retrieval Problem (iii) Uncommitted Data Problem

OR

- 16 Illustrate, with the help of an example with at least 3 transactions, how the 2-Phase Locking Protocol ensures concurrency control. (6)

Module IV

17. Which are the situations in which variable length-records are required in a file? (6)
Discuss the slotted-page scheme for accommodating variable length records.

OR

18. Assume that there is a table with the following structure. (6)

Admission No.	Adhaar No.	Name	Age
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Admission No. is the primary key and Adhaar No. is an alternate key. Show a sample file and the corresponding index structure for the table with at least 6 data records for (i) primary index (ii) secondary index on Adhaar No. (Assume that there are two data records per disk block.)

Module V

- 19 Illustrate, with the help of suitable examples, how multi-set and array types are created in object-based databases. (6)

OR

- 20 Illustrate, with the help of a suitable example, the structure of a DTD. Write any two sample XML documents that satisfy your example DTD. (6)

KOURDES MATHA COLLEGE OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF COMPUTER APPLICATIONS

Semester: 2nd

Branch: MCA Admission Year: 2021

Second Series Examination / May 2022

20MCA102 /Advanced Database Management Systems

Time: 1 ½ Hours

Max. Marks: 30

Part-A (Answer All Questions)

Q.No	Questions	Marks	CO	BL
1	What is Functional Dependency? Explain its axioms.	3	CO2	K1
2	What is Dense Index?	3	CO4	K1
3	Briefly Explain the steps in Query Processing.	3	CO4	K1
4	Explain RAID Level 0,Level 3 and Level 5.	3	CO4	K2
5	Explain BCNF.	3	CO2	K1
6	Explain Secondary Indices.	3	CO4	K1

Part-B (Answer all Questions)

✓	What is Normalisation?Explain the First Three Normal Forms	6	CO2	K1
✗	What are the different types of File Organisations?	6	CO4	K1

LOURDES MATHA COLLEGE OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF COMPUTER APPLICATIONS

Semester: 2nd Branch: MCA Admission Year: 2021

Second Series Examination/ May 2022

Time: 1 ½ Hours 20MCA172 /ADVANCED OPERATING SYSTEMS Max. Marks: 30

Part-A (Answer All Questions)

Q. No	Questions	Marks	CO	BL
1	Explain the requirements of Mutual Exclusion algorithms	3	CO2	L2
2	Explain potential security violations.	3	CO2	L2
3	Illustrate Access Matrix model.	3	CO2	L2
4	Distinguish between load balancing and load sharing?	3	CO3	L4
5	List out the major components of a load distributing algorithm.	3	CO3	L1
6	Discuss the mechanisms for building Distributed File Systems.	3	CO3	L2

Part-B (Answer any two Questions)

(a) Classify Mutual Exclusion algorithms in detail	6	CO2	L2
(b) Explain Lamport's Algorithm for Mutual Exclusion	6	CO3	L2
8 Discuss Central Server algorithm and Migration algorithm.	6	CO3	L2
9 Discuss Sender Initiated Algorithm and Receiver Initiated Algorithm.	6	CO3	L2

LOURDES MATHA COLLEGE OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF COMPUTER APPLICATIONS

Semester: 2nd

Branch: MCA

Admission Year: 2021

Second Series Examination / May 2022

20MCA188/Artificial Intelligence

Time: 1½ Hours

Max. Marks: 30

Part-A (Answer All Questions)

Q.No	Questions	Marks	CO	BL
1	Compare and Contrast Informed & Uninformed Search.	3	CO2	K4
2	What is the use of Heuristic Function?	3	CO2	K3
3	Explain BFS Strategy.	3	CO2	K4
4	Describe Iterative Deepening Search	3	CO2	K1
5	Explain quantifiers in FOPL with example.	3	CO4	K4
6	List out the rules used to construct Well-formed formulas (wffs) in FOPL.	3	CO4	K4

Part-B (Answer Any 2)

7	Illustrate the Greedy Best First Search Algorithm with example.	6	CO2	K4
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Reg No.: _____

Name: Vipin Kumar N.

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

First Semester MCA (2 Year) Degree Examination December 2021

Course Code: 20MCA105

Course Name: ADVANCED DATA STRUCTURES

Max. Marks: 60

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- | | | |
|----|---|-----|
| 1 | Distinguish between linear data structure and non-linear data structure | (3) |
| 2 | Explain any two collision resolution methods in Hashing | (3) |
| 3 | Explain the characteristics of Balanced Binary Search Tree | (3) |
| 4 | What is a Splay Tree? What are the advantages of Splay trees? | (3) |
| 5 | A binomial heap has four binomial trees. Their degrees are 0,1,2 and 4. After you add an entry how many binomial trees will the heap have? What are the degrees of the trees? | (3) |
| 6 | Explain the characteristics of Fibonacci Heap | (3) |
| 7 | Compare and Contrast Breadth First Search and Depth First Search | (3) |
| 8 | What is topological sort in a graph? | (3) |
| 9 | What is smart contract? | (3) |
| 10 | Explain Transaction model in Block Chain Technology. | (3) |

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

- 11 How do you perform Amortized analysis using Aggregate method? Illustrate (6) with the example of Incrementing Binary Counter

OR

- 12 Explain Disjoint Set Data structure. What are the operations performed on (6) Disjoint Set Data structure

Module II

- 13 Construct a red-black tree by inserting the keys in the following sequence into an (6) initially empty red-black tree: 13, 10, 8, 3, 4 and 9. Show each step

OR

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14 Describe BTree. How can we insert a key into a BTree? (6)

Module III

- 15 a) Draw a binomial heap whose keys are 6,3,5,18,1,10,7,9,16,10,20 (6)
b) Explain how union operation is performed in a Binomial heap

OR

16 Describe the Extract Min Operation in Fibonacci Heap with the help of an example. What is the amortized cost of the operation? (6)

Module IV

What is a Minimum Spanning tree? Explain Kruskal's algorithm to find Minimum Spanning tree with an example (6)

OR

18 Explain Strongly Connected Components. How can you find Strongly connected components of a graph? (6)

19 Describe Block Chain Architecture. **Module V**

(6)

OR

20 Explain Data Structure and Data types in Block Chain Technology (6)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
05208LMCA103122006

First Semester MCA (2 Year) Degree Examination December 2021

Course Code: 20MCA103
Course Name: DIGITAL FUNDAMENTALS & COMPUTER
ARCHITECTURE

Max. Marks: 60

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- 1 Convert the decimal number 3.248×10^4 to a single precision floating point binary number. (3)
- 2 Implement a full adder using 8:1 MUX. (3)
- 3 Explain Serial in Serial out shift register with the help of circuit diagram. (3)
- 4 How can you convert JK Flip flop to D Flip flop? (3)
- 5 A program runs in 10 second on computer A, which has a 2 GHz clock. You are trying to help a computer designer build a computer, B, which will run this program in 6 seconds. The designer has determined that a substantial increase in the clock rate is possible, but this increase will affect the rest of the CPU design, causing computer B to require 1.2 times as many clock cycles as computer A for this program. What clock rate should you tell the designer to target? (3)
- 6 Describe the code sequence of $C = A + B$ in Single Accumulator organization and Stack organization of instruction set architecture. (3)
- 7 Explain any one of the bus arbitration schemes in DMA. (3)
- 8 How to calculate branch target address in branch on equal(beq) instruction? (3)
- 9 Write a short note on memory operations:
a) Write back b) Write through (3)
- 10 Explain different types of Read Only Memory (ROM). (3)

PART B
Answer any one question from each module. Each question carries 6 marks.

Module I

Minimize the Boolean expression $f(A,B,C,D) = \sum(0,1,3,5,7,8,9,11,13,15)$ using

Karnaugh map and realize it using NAND gate.

A

12 a Using Boolean algebra techniques, simplify the

$$\text{b expression } AB + A(B+C) + B(B+C)$$

OR

- Express $+19$ and -19 in 2's complement form.

Module II

13 Explain the working of an edge triggered SR Flip flop in detail.

OR

14 Design a 3 bit UP/DOWN synchronous counter.

Module III

- 15 What you meant by addressing modes? Explain any three addressing modes that have been used in recent computers.

OR

16 Explain the five classic components of a computer with figure.

Module IV

17 Draw a single data path representation for R-type instruction.

OR

- 18 • How should two or more simultaneous interrupt requests be handled? Explain with figure.

Module V

- 19 • How the virtual address is converted into real address in a paged virtual memory system? Explain.

OR

- 20 A computer system uses 16-bit memory addresses. It has a 2K-byte cache organized in a direct mapped manner with 64 bytes per cache block. Assume

that the size of each memory word is 1 byte. Calculate the number of bits in each of the Tag, Block, and Word fields of the memory address.

Reg No.: 3032

Name: Vipin Kumar N.

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

First Semester MCA (2 Year) Degree Examination December 2021

Course Code: 20MCA101

Course Name: MATHEMATICAL FOUNDATIONS FOR COMPUTING

Max. Marks: 60

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- 1 Verify De-Morgan's laws for the following sets. (3)
 $A = \{1, 2, 3\}$, $B = \{2, 3, 4\}$ and $U = \{1, 2, 3, 4, 5, 6\}$
- 2 Define the following and give one example for each. (3)
i) one-one function ii) onto function
- 3 Using division algorithm, find the gcd of 86 and 58. (3)
- 4 If $a \equiv b \pmod{m}$ show that $ac \equiv bc \pmod{m}$ (3)
- 5 Define i) complete graph and ii) bipartite graph and give one example for each. (3)
- 6 Define Hamiltonian cycle and Euler circuit with examples. (3)
- 7 Find the rank of matrix $A = \begin{bmatrix} 0 & 1 & 0 \\ -1 & 0 & -4 \\ 0 & 4 & 0 \end{bmatrix}$ (3)
- 8 Find the matrix C such that $Q = X^T C X$ (3)
where $Q = -3x^2 + 4xy - y^2 + 2xz - 5z^2$.
- 9 State the principle of least square. (3)
- 10 Explain the terms correlation and regression. (3)

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

- 11 a) Let $f, g: R \rightarrow R$ defined by $f(x) = x^2 - 2$, $g(x) = x^2 + 4$. Find $f \circ g$ and $g \circ f$. Is $f \circ g = g \circ f$? (3)
 b) Let R be a relation on the set of integers defined by $R = \{(x,y) | x-y \text{ is divisible by } 6\}$. (3)
 Check whether R is an equivalence relation.

OR

- 12 a) Define a partial ordering relation. Show that the inclusion relation \subseteq is a partial ordering relation on the power set $P(S)$ of a given set S . (3)
 b) Using Warshall's algorithm, find the transitive closure of the relation $\{(1,3), (3,2), (2,4), (3,1), (4,1)\}$ on $\{1,2,3,4\}$. (3)

Module II

- 13 a) Solve the set of simultaneous congruences, $x \equiv 3 \pmod{5}$; $x \equiv 4 \pmod{7}$; $x \equiv 6 \pmod{9}$. (6)

OR

- 14 a) Solve the recurrence relation $a_n - 5a_{n-1} + 6a_{n-2} = 3^n + n$, given $a_0 = 0$ and $a_1 = 1$. (6)

Module III

- 15 a) Show that a connected graph G is Euler if and only if all the vertices of G are of even degree. (6)

OR

- 16 a) Show that the maximum number of edges in a simple graph with n vertices is nC_2 . (6)

Module IV

17-a) Solve the following system of equations using Gauss - Elimination method: (6)

$$\begin{aligned}x + 2y - z &= 3 \\3x - y + 2z &= 1 \\2x - 2y + 3z &= 2\end{aligned}$$

$$x - y + z = -1$$

OR

18 a) Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 1 & 1 & 2 \\ -1 & 2 & 1 \\ 0 & 1 & 3 \end{bmatrix}$ (6)

Module V

19 a) Calculate the correlation coefficient for the following heights(in inches) of father (x) and their son (y). (6)

x	65	66	67	67	68	69	70	72
y	67	68	65	68	72	72	69	71

OR

20 a) Fit a straight line to the following set of data (6)

x	5	10	15	20	25
y	16	19	23	26	30

Reg No.: 2032

Name: Vipin Kumar N

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

First Semester MCA (2 Year) Degree Examination December 2021

Course Code: 20MCA107

Course Name: ADVANCED SOFTWARE ENGINEERING

Max. Marks: 60

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- | | | |
|----|---|-----|
| 1 | How do you measure software reliability? | (3) |
| 2 | What is COCOMO estimation model? | (3) |
| 3 | What are the four dimensions of software quality? | (3) |
| 4 | Explain the three states in which files reside in Git. | (3) |
| 5 | What are the characteristics of a design class? | (3) |
| 6 | Write about any three key classes in xUnit architecture. | (3) |
| 7 | List out the steps in agile methodology. | (3) |
| 8 | Explain decision table testing with suitable diagram. | (3) |
| 9 | What are the benefits of configuration management? | (3) |
| 10 | Distinguish between build automation and deployment automation. | (3) |

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

- 11 Draw a waterfall model and explain the life cycle of a software system. (6)

OR

- 12 Prepare a basic software requirement specification for basic library system. (6)

Module II

- 13 What is a Git repository? Explain the process of Cloning a Git repository. (6)

OR

- 14 Explain how to view the commit history in Git. Write the syntax of the commands used. (6)

Module III

- 15 Explain the concepts of Anti-pattern. (6)

OR

- 16 What are single condition tests and expected error tests in Unit Test? Explain (6)

Module IV

17 Explain the meetings involved in scrum software development methodology. (6)

OR

18 What is blackbox testing? Explain. (6)

Module V

19 Define continuous integration. Explain the essential practices required for continuous integration. (6)

OR

20 With a neat diagram, explain deployment pipeline and the various stages of deployment pipeline. (6)

LOURDES MATHA COLLEGE OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF COMPUTER APPLICATIONS

Semester: 1

Branch: MCA

Admission Year: 2021

First Series Examination/December 2021

20MCA103 / Digital Fundamentals & Computer Architecture

Time: 1 ½ Hours

Max. Marks: 30

Part-A (Answer All Questions)

Q.No	Questions	Marks	CO	BL
✓ 1	Represent +37, -37 in 1's complement and 2's complement form.	3	CO1	K4
✓ 2	Distinguish between Sum Of Product and Product Of Sums with suitable examples.	3	CO1	K4
✓ 3	Show that $AB'C+B+BD'+ABD'+A'C=B+C$	3	CO1	K3
✓ 4	How to represent a 4-variable K-map.	3	CO1	K2
✓ 5	Reduce using mapping the expression $Y=(A + B + C')(A + B' + C')(A' + B' + C)(A' + B' + C')$	3	CO1	K3
✓ 6	Define combinational circuit.	3	CO1	K1

Part-B (Answer any two Questions)

✓ 7	Explain in detail about different logic gates.	6	CO1	K2
✓ 8	Minimize the Boolean expression $f(A,B,C,D)=\sum m(0,1,2,3,4,6,8,9)+d(10,11)$ using Karnaugh map and realize it using NAND gates.	6	CO1	K3
9	Design different types of adders.	6	CO1	K6

LOURDES MATHA COLLEGE OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF COMPUTER APPLICATIONS

Semester: 1st

Branch: MCA

Admission Year: 2021

First Series Examination / DECEMBER 2021

20MCA107-ADVANCED SOFTWARE ENGINEERING

Time: 1½ hour

Max.marks: 30

Part-A (Answer All Questions)

Q.No	Questions	Marks	CO	BL
1	Explain any six characteristics of a Software?	3	CO1	L2
2	What is software engineering? What is the need for software engineering?	3	CO1	L1
3	What is the relevance of bathtub curve to measure software reliability?	3	CO1	L1
4	Differentiate a) Alpha testing and Beta testing. b) Verification and Validation	3	CO4	L4
5	Explain the basic principles of software testing?	3	CO4	L2
6	What are the characteristics of good requirements? Explain MOSCOW method.	3	CO1	L2

Part-B (Answer Any TWO Questions)

7	What are the various types of cost estimation models? Explain COCOMO cost estimation model.	6	CO1	L2
8	What is the relevance of software testing? Differentiate Black Box and White Box Testing.	6	CO4	L4
9	Explain in brief the Life cycle of a software system.	6	CO1	L2

LOURDES MATHA COLLEGE OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF COMPUTER APPLICATIONS

Semester: 1

Branch: MCA

Admission Year: 2021

First Series Examination/December 2021

20MCA104 /Advanced Data Structures

Time: 1 ½ Hours

Max. Marks: 30

Part-A (Answer All Questions)

Q.No	Questions	Marks	CO	BL
✓ 1	Explain Data Structure and its classification	3	CO1	K2
✓ 2	Write note on Stack	3	CO1	K1
✓ 3	Compare Queue and circular Queue	3	CO1	K4
✓ 4	What is Hashing?	3	CO1	K1
✓ 5.	How a set is implemented using bit string?	3	CO1	K1
✓ 6.	Define Disjoint Set.	3	CO1	K1

Part-B (Answer any two Questions)

✓ 7	Explain different types of hashing with example.	6	CO1	K2
✓ 8	What are the different collision resolution techniques in hashing?	6	CO1	K2
9	Explain different ways to represent a set data structure.	6	CO1	K2

LOURDES MATHA COLLEGE OF SCIENCE AND TECHNOLOGY

Department of Computer Application

Semester: 1

Branch: MCA Admission Year: 2021

First Series Examination/Nov 2021

20MCA101-Mathematical Foundations for Computing

Time: 1 $\frac{1}{2}$ Hours

Max. Marks: 30

Part-A (Answer All Questions)

Q. No	Questions	Marks	CO	BL
1	Show that $A \cup B = A \cap B \Rightarrow A = B$.	3	CO1	K2
2	Find the number of distinct relations from a set A to B.	3	CO1	K5
3	Define Power set.	3	CO1	K1
4	Show that $(A \cup B)^c = A^c \cap B^c$	3	CO1	K2
5	Let A = {1,2,3,4} and B = {p,q,r,s} if R = {(1,p), (1,q), (1,r), (2,q), (2,r), (2,s)} is a relation from A to B. Write the matrix representation of R.	3	CO1	K5
6	Consider the relation R on A = {4,5,6,7} defined by R = {(4,5), (5,5), (5,6), (6,7), (7,4), (7,7)}. Find the symmetric closure of R.	3	CO1	K5

P.t.o

Part-B (Answer any two Questions)

✓ 7	Define Equivalence relation. Prove for $x, y \in Z$ the relation defined by $R = \{(x, y) : 5 \text{ divides } x - y\}$ is an equivalence relation.	6	CO1	K3
✓ 8	Using Warshall's algorithm find the transitive closure of the relation $\{(1, 2), (2, 3), (3, 4), (2, 1)\}$ on $\{1, 2, 3, 4\}$.	6	CO1	K3
9	Define Cartesian product of sets. Prove that $A \times (B \cup C) = (A \times B) \cup (A \times C)$.	6	CO1	K1