

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**0520MCA102052303**  
**Second Semester MCA (Two Years) (R, S) Examination May 2024**

**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  | Explain the various levels of data abstraction in a concise manner using a diagram. | (3) |
| 2  | Demonstrate the extended ER feature specialization.                                 | (3) |
| 3  | List down inference rules for functional dependency.                                | (3) |
| 4  | Define Join Dependency and Fifth Normal Form (5NF).                                 | (3) |
| 5  | Describe various types of locks used in concurrency control methods.                | (3) |
| 6  | Explain the properties of transactions.   | (3) |
| 7  | Illustrate static hashing.  | (3) |
| 8  | Differentiate fixed and variable length record organization.                        | (3) |
| 9  | Explain CAP theorem.  | (3) |
| 10 | Discuss various methods to fragment data in a distributed database.                 | (3) |

**PART B**

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

**Module I**

- 11 a Design an Entity Relationship Diagram for a car race database with the following requirements. (4)

For each car we keep its registration number (unique), engine type, colour and model. Each driver has unique ID, name, DoB, and age which is derived from DoB. Drivers use cars to enter races, each race has some attributes such as the race number (unique), race type, the number of rounds, and date. Each driver can enter many races and can use the same car or different one in each race. Thus

the same car can participate in many races. In the design, we want to capture which car is used by which driver and in which race.

- b Convert ER diagram constructed in above question to relational schema. (2)

OR

- 12 Demonstrate Select, Project, Union, Intersection and Join operations in relational algebra. (6)

Module II

- 13 Consider the following relation. (6)

RegNo	Sname	Cid	Cname	Mark	Grade
1	Ivan	101	DBMS	80	A
1	Ivan	102	OS	70	B
2	Dave	101	DBMS	60	C
2	Dave	102	OS	95	S
3	Smith	103	OOP	95	S
4	Dan	103	OOP	72	B
4	Dan	102	OS	83	A

Some of the functional dependencies present in this relation are RegNo --> Sname, Cid --> Cname, Mark--> Grade, {RegNo, Cid} --> Mark.

Decompose this relation into 3NF relations. Justify your answer.

OR

- 14 Define 4NF. Give a relation which is not in 4NF and convert it into 4NF. Justify your example. (6)

Module III

- 15 Explain any problems that may occur if concurrent execution of transactions is not controlled. Use proper examples. (6)

OR

- 16 How Concurrency can be controlled using Time Stamps? Explain the wait/die, wound/wait schemes for concurrency control. (6)

**Module IV**

- 17 Demonstrate various RAID levels with diagram. (6)

**OR**

- 18 Explain B Tree and B+ Tree index structures. (6)

**Module V**

- 19 a Explain MongoDB sharding. (3)

- b Explain MongoDB Replication. (3)

**OR**

- 20 a Explain Arrays and multisets in object based database with example. (3)

- b Explain Object Identity and Reference types in object based database with example. (3)

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**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  | With figures, explain the basic topologies used in computer networks.  | (3) |
| 2  | Calculate the propagation time and transmission time for a 5Mbytes message if the bandwidth of the network is 1Mbps. Assume that distance between the sender and receiver is 12000km and light travels at $2.4 \times 10^8$ m/s. | (3) |
| 3  | Compare Frequency Division Multiplexing with Time Division Multiplexing  | (3) |
| 4  | With figure explain how Go-Back N ARQ works.   | (3) |
| 5  | Differentiate between virtual circuit and datagram approach used in packet switching.  | (3) |
| 6  | Explain distance vector routing used in packet routing.  | (3) |
| 7  | Write short note on Ethernet along with its frame format.  | (3) |
| 8  | Explain how token passing mechanism works in IEEE 802.5 standard.  | (3) |
| 9  | Explain how Simple Network Management Protocol manages devices in a network with figure.   | (3) |
| 10 | Why gateways are used in computer networks? list its features.   | (3) |

**PART B**

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

**Module I**

- |    |  |     |
|----|--|-----|
| 11 | With figure explain the responsibilities of various OSI protocol layers. | (6) |
|----|--|-----|

**OR**

- |    |   |     |
|----|---|-----|
| 12 | Write short notes on the following protocols used in computer network | (6) |
|    | a) ARP      b) ICMP      c) POP3      d) SMTP                         |     |

**Module II**

- 13 Elucidate TCP header structure and major transport layer services. (6)

**OR**

- 14 Explain congestion control. What are the factors which causes it? Explain each categories of congestion control in detail. (6)

**Module III**

- 15 a) Express how address depletion faced by classful addressing is overcome by classless addressing. (4)

- b) A block of address is granted to a small organization. One of the address is 205.16.37.39/28. Find the starting and ending address given to organization (2)

**OR**

- 16 With suitable diagram explain IPv4 datagram packet format. (6)

**Module IV**

- 17 a) Explain briefly on error detection code technique checksum used in data communication. (3)

- b) For this given data 11001100 10101010 11110000 11000011, perform check sum operation at sender site and receiver site and verify the data at receiver site. (3)

**OR**

- 18 Explain Carrier Sense Multiple Access with collision detection algorithm in detail. (6)

**Module V**

- 19 Explain Bluetooth technology with its architecture. (6)

**OR**

- 20 Explain various functions and protocols used by network management system. (6)

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**Course Code: 20MCA166**  
**Course Name: FUNCTIONAL PROGRAMMING**

Max. Marks: 60

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 3 marks.*

- 1 Summarize the features of Functional Programming. (3)
- 2 How are Functional Programming Languages categorized? (3)
- 3 What are the four parts of Lambda Abstraction? Explain with an example. (3)
- 4 What is a lazy functional language? (3)
- 5 Predict the output of the following along with a detailed explanation on how did you arrive at the answer: (3)
- ```
ghci> ["Sports" | k <- [2 .. 6]]
```
- 6 Explain about List patterns. (3)
- 7 Define Binary tree as a Recursive Type. (3)
- 8 How does the below code snippet execute:
- ```
data Nat = Zero | Succ Nat deriving Show
issero :: Nat -> Bool
issero Zero = True
issero (Succ _) = False
```
- 9 Define a Haskell function to find the factorial of a given number. (3)
- 10 "Comprehensions can have multiple generators". Comment on it. (3)

**PART B**

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

**Module I**

- 11 Design a recursive function to subtract two numbers. (6)
- OR**
- 12 Make all parentheses explicit in the following  $\lambda$ -expressions: (3)
- (a)  $\lambda x.xz \lambda y.xy$

(b)  $(\lambda x.xz) \lambda y.w \lambda w.wyzx$

(3)

**Module II**

- 13 Explain the concept of currying with the help of an example.

(6)

**OR**

- 14 Discuss about Functional Composition with the help of an example.

(6)

**Module III**

- 15 How are Map and Filters helpful in functional programming?

(6)

**OR**

- 16 Given below is the definition of a function "intreverse"

intreverse :: Int -> Int

intreverse n

| n < 10 = n

| otherwise = (intreverse (div n 10)) + (mod n 10) \* (power 10 (intlog 10 n))

(6)

Predict the output and Prove your answer.

**Module IV**

- 17 Explain about Composite Types in detail.

(6)

**OR**

- 18 Find the equivalent decimal representation of the following with detailed explanation:

(6)

ghci> succ (succ (succ (succ (succ 0))))

**Module V**

- 19 (a) How are Haskell functions defined?

(3)

(b) What does => mean in Haskell?

(3)

**OR**

- 20 Define a queue data type in Haskell along with any two operations on it with the help of examples.

(6)

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Reg No.: \_\_\_\_\_

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Second Semester MCA (Two Years) Degree (R,S) Examination May 2024

**Course Code: 20MCA188**

**Course Name: ARTIFICIAL INTELLIGENCE**

Max. Marks: 60

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 3 marks.*

Marks

- |    |  |     |
|----|--|-----|
| 1  | Discuss any three production system characteristics.                       | (3) |
| 2  | Solve the crypt-arithmetic puzzle $GO + TO = OUT$ .                        | (3) |
| 3  | Why searching is important in AI? How searching algorithms are classified? | (3) |
| 4  | What is admissible Heuristics? Give any two examples.                      | (3) |
| 5  | Represent the following statements using CD structures.                    | (3) |
|    | a. Bill is a programmer  |     |
|    | b. Sam gave Mary a box of candy  |     |
|    | c. Charlie drove the car fast.   |     |
| 6  | What is the drawback of Minimax algorithm? How it can be overcome?         | (3) |
| 7  | What are quantifiers? Explain with an example.                             | (3) |
| 8  | Explain inference rules in FOPL.   | (3) |
| 9  | What is the importance of an expert system?                                | (3) |
| 10 | Discuss various languages in AI.   | (3) |

**PART B**

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

**Module I**

- |    |   |     |
|----|---|-----|
| 11 | What is Water Jug problem in AI? How it can be represented using state space representation scheme. Draw the search tree for the problem. | (6) |
|----|---|-----|

**OR**

- |    |   |     |
|----|---|-----|
| 12 | Explain various characteristics of AI problems with appropriate examples. | (6) |
|----|---|-----|

**Module II**

- |    |  |     |
|----|--|-----|
| 13 | Compare Hill climbing and steepest ascend hill climbing search procedures. | (6) |
|----|--|-----|



**OR**

- 14 Explain A\* Algorithm. What is its advantage over Best First Search algorithm? (6)

**Module III**

- 15 What is Conceptual dependency theory? What are its components? (6)

**OR**

- 16 Express the following concepts as semantic network structure with interconnected nodes and labeled arcs: (6)

Company Hamen is a software development company. Three departments within the company are Sales, Administration and Programming. Ansu is the manager of Programming. Deepthi and Vini are Programmers. Deepthi is married to Vipin. Vipin is an editor for journal of Computing. They have three children and live in Elm street. Deepthi wear glasses and is five feet four inches tall.

**Module IV**

- 17 Explain the various forms of learning. (6)

**OR**

- 18 What is goal stack planning algorithm? Explain with an example. (6)

**Module V**

- 19 Mention characteristic features of an expert system and explain its architecture. (6)

**OR**

- 20 How fuzzy sets are different from crisp sets? Explain following fuzzy operations with examples. (6)

i) Fuzzy Union ii) Fuzzy Intersection iii) Fuzzy Compliment

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