

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

✓✓ Prove that $(A \cup B)' = A' \cap B'$ (3)

2 If $A = \{1,2,3,4,5\}$ and $B = \{1,2,3,8,9\}$ and the function $f:A \rightarrow B$ and $g:A \rightarrow A$ defined (3)

by $f = \{(1,8), (3,9), (4,3), (2,1), (5,2)\}$ and

$g = \{(1,2), (3,1), (2,2), (4,3), (5,2)\}$.

Find: (1) $f \circ g$ (2) $g \circ g$

3 Define GCD. Find $\text{GCD}(2406, 654) = 6$ (3)

4 Solve the recurrence relation (3)

$$a_{n+2} = 4a_{n+1} - 4a_n, a_0 = 1, a_1 = 3$$

5 (3)



Check whether the following graphs are isomorphic.

6 ✓ Define complete Bipartite graph. Draw the graph $K_{2,4}$. (3)

7 ✓ Determine the rank of $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 2 & 5 \end{bmatrix}$ (3)

8 ✓ Solve using Gauss elimination method : $x_1 + x_3 = 0, x_2 + x_3 = 0, x_1 + x_2 + x_3 = 0$ (3)

9 ✓ Explain principle of least square. (3)

10 ✓ Fit a straight line $y = a + bx$ to the following data by the principle of least squares: (3)

x:	0	1	3	6	8
y:	1	3	2	5	4

$a = 1.4394$
 $b = 0.4331$

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$y = 1.4394 + 0.4331x$

PART B

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

Module I

11 Define Equivalence Relation (6)

Prove that the relation R on the set of integer Z defined by $R = \{(x,y) \mid x-y \text{ is divisible by } 6\}$ is an equivalence relation ✓

OR

12 Explain closure of relations. Using Warshalls Algorithm find the transitive closure (6) of the relation $R = \{(1,2)(2,3)(3,3)\}$ on the set $A = \{1,2,3\}$

Module II

13 Solve the linear Diophantine Equation $60x + 33y = 9$ (6)

OR

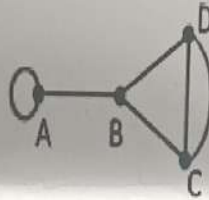
14 Solve the recurrence equation (6)

$$a_{n+2} - 4a_{n+1} + 3a_n = -200, a_0 = 0, a_1 = 1$$

Module III

15 Give the adjacency matrix and incidence matrix for the following graph is (6)

$$\begin{matrix} 2 & 1 & 0 & 0 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 2 \\ 0 & 1 & 2 & 0 \end{matrix}$$



OR

16 Define Hamiltonian cycle and Euler circuit with example. (6)

Module IV

17 Find the eigenvalues and eigenvectors of $\begin{bmatrix} 4 & 2 & -2 \\ 2 & 5 & 0 \\ -2 & 0 & 3 \end{bmatrix}$ (6)

OR

18 What kind of conic section is given by the quadratic form $4x_1^2 + 6x_1x_2 - 4x_2^2 = 10$. (6)

Module V

19 Fit a parabola to the following data. (6)

X	1.0	1.5	2.0	2.5	3.1	4.0
Y	1.1	1.3	1.6	2.0	3.4	4.2

OR

20 The marks secured by 9 students in Mathematics, English are as given below (6)
Calculate the rank correlation coefficient.

X	10	15	12	17	13	16	24	14	22
Y	30	42	45	46	33	34	40	35	39

Reg No.: TVE22MCA-23

Name: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

First Semester MCA (Two Year) Degree (R, S) Examination December/January 2022-23

MCA-MCA-2-M6L2

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 ✓ Express the decimal number -23 as an 8 bit number in the 1's and 2's complement form. (3)
- ✓ 2 ✓ Design a 4:1 MUX with the help of a truth table and logic diagram. (3)
- ✓ 3 ✓ Distinguish between Combinational and Sequential circuits. (3)
- 4 ✓ With the help of logic and timing diagram, design an Asynchronous Two bit Up-counter using positive edge triggered JK Flip-Flops. (3)
- ✓ 5 ✓ Write the code sequence for $B = A + C$ in stack and accumulator instruction set architecture. (3)
push A, push C, add, pop C, load R1, A, load R2, B, store R2, C
- 6 Differentiate between Big-endian and Little-endian address assignments. (3)
LSB → TOP
- 7 Explain the use of Vectored Interrupts. (3)
- 8- What is Bus Arbitration? List out and explain two approaches to Bus Arbitration. (3)
- 9 Explain the operation of a static RAM cell with the help of a diagram (3)
- ✓ 10 - Differentiate between PROM and EPROM? (3)

PART B

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

Module I

- 11 Design an Octal to Binary encoder with the help of a truth table and logic diagram. (6)

OR

- ✓ 12 ✓ Reduce the Boolean function specified in the truth table to its minimum SOP (6)

form by using a K-Map.

Inputs			Output
X	Y	Z	S
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

Module II

- 13 Explain the working of an edge triggered SR Flip-Flop with the help of a circuit and timing diagram. (6)

OR

- ✓ 14 ✓ What are the basic functions of a shift register? Explain 4 bit PISO shift register with a neat diagram. (6)

Module III

- ✓ 15 ✓ Explain classic components of a computer system with the help of a block diagram. (6)

OR

- 16 What is Addressing Mode? Describe any three Addressing Modes with examples. (6)

Module IV

- 17 With a neat diagram, explain the operation of DMA controllers in a computer system. (6)

OR

- 18 What is pipeline hazard? Explain any three hazards in pipelined processors with examples. (6)

Module V

- 19 Explain virtual memory address translation using page table with the help of a neat diagram. (6)

OR

- 20 What is cache memory? Explain different cache mapping techniques with examples. (6)

Course Code: 20MCA105

Course Name: ADVANCED DATA STRUCTURES

Max. Marks: 60

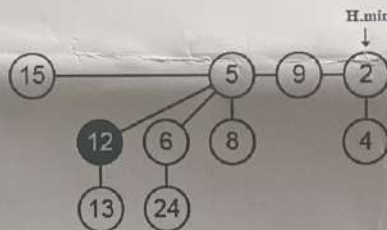
Duration: 3 Hours

PART A

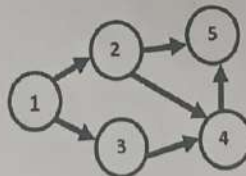
Answer all questions, each carries 3 marks.

Marks

- ✓ 1 Differentiate between Stack and Queue. (3)
- ✓ 2 What is Set data structure? How is a Set implemented using Bit String? (3)
- ✓ 3 State the properties of a Red Black tree. (3)
- ✓ 4 What is meant by Splay Tree? (3)
- ✓ 5 List out any three operations supported by a Mergeable Heap. (3)
- 6 Find the Potential of the Fibonacci Heap given below. (3)



- 7 ✓ What is meant by Bi-Connected Components? Illustrate with an example. (3)
- 8 ✓ Write any one of the Topological Ordering of the graph. (3)



- 9 ✓ Explain block chaining with an example. (3)
- 10 ✓ What is Merkle tree? Give example. (3)

PART B

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

Module I

- 11 How do you perform Amortised Analysis using Accounting method? Illustrate with Incrementing Binary Counter example. (6)

OR

- ✓12 What are the different collision resolution techniques in hashing? Explain any one of them. (6)

Module II

- ✓13 Explain different cases of inserting nodes into a Red-Black Tree with an illustration. (6)

OR

- 14 How a full node is splitted in B Tree Insertion procedure? Explain with a diagram. (6)

Module III

- 15 ✓ Explain how the Decrease-Key operation is performed on Binomial Heaps. What is the Amortised Cost of this operation? (6)

OR

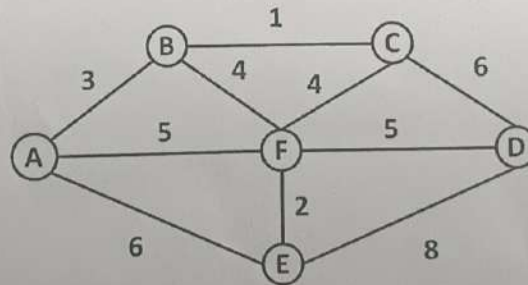
- 16 ✗ Describe how Extract-Min operation is performed in a Fibonacci Heap? Illustrate with an example. (6)

Module IV

- 17 Explain Depth First Search algorithm with a suitable example. (6)

OR

- 18 ✓ Apply Kruskal's algorithm to find a minimum spanning tree of the following graph. (6)



Module V

- ✓19 Explain Blockchain Architecture in detail. (6)

OR

- 20 Describe the data types in Blockchain. (6)

Open hashing →
closed hashing

collision & d

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

First Semester MCA (Two Year) Degree (R,S) Examination December/January 2022-23

Course Code: 20MCA107

Course Name: ADVANCED SOFTWARE ENGINEERING

Maxmark:60

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- 1 - Explain Sashimi Model. (3)
- 2 ✓ Explain COCOMO Estimation Model. (3)
- 3 - Explain Literate Programming. (3)
- 4 Explain Conformance Quality. What are the techniques used for ensuring conformance quality? (3)
- 5 ✓ Explain Unit testing. (3)
- 6 What is Anti-Patterns? (3)
- 7 ✓ Explain Defect Life Cycle. (3)
- 8 What is Regression Testing? (3)
- 9 ✓ Explain Version Control System? What is the purpose of using it? (3)
- 10 - Explain the benefits of Software Configuration Management? (3)

PART B

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

Module I

- 11 Explain Prototype. Also its types, advantages and disadvantages. (6)

OR

- 12 ✓ What are the characteristics of a Software? (6)

Module II

- 13 ✓ Explain how to clone a Git repository. (6)

OR

- 14 Explain the four dimensions of quality. (6)

reaction of
an ideal
mindset

Module III

✓ 15 What is a Design pattern? Explain how to select a design pattern for your problem. (6)

OR

16 Explain xUnit architecture and write example for testing using any frame work. (6)

Module IV

17 Explain Scrum framework. (6)

OR

18 ✓ Explain Black-Box testing and White-Box testing. Give any two techniques for each testing type. (6)

Module V

19 Explain the principles of software delivery. (6)

OR

20 ✓ Explain the essential practices that should be enforced on Continuous Integration (CI) teams. (6)
