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I Semester M.C.A. Degree Examination, June/July - 2023

**COMPUTER SCIENCE****Computer Organization and Architecture****(CBCS Y2k20 Scheme)****Paper : IMCA3****Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates:**

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

**PART - A****Answer any Five questions.****(5×6=30)**

1. Explain Von-Nuemann Architecture with a neat diagram. (6)
2. Differential between RISC and CISC. (6)
3. Subtract  $24_{(10)}$  from  $14_{(10)}$  Using 2's Complement Method. (6)
4. Explain Error Detector Using Hamming Code. (6)
5. Explain addressing models and its types. (6)
6. Explain the working of half adder and full adder, with a neat circuit diagram. (6)
7. Explain Instruction Level Parallelism. (6)
8. Explain Virtual Memory. (6)

**PART - B****Answer any Four questions.****(4×10=40)**

9. a) Simplify:  
 $F(A,B,C,D) = \sum m(0,1,2,3,4,5) + d(10,11,12,13)$  in SOP minimal form. (5)
- b) Analyse booth multiplication algorithm with flow chart, hardware implementation with an example. (5)
10. a) Explain Arithmetic Logic shift unit. (5)
- b) Explain the different registers in basic computer. (5)

**[P.T.O.]**



11. a) Explain Interrupt cycle with flow chart. (5)  
b) Explain different types of ROMs. (5)
12. a) Explain the working of DMA data transfer with a neat block diagram. (5)  
b) Explain different instruction formats with an example for each. (5)
13. a) What is memory mapped I/o and Program controlled I/O. (5)  
b) Explain binary counter. (5)
14. Write short note on:  
a) MIMD Architecture (5)  
b) Inter Process communication. (5)
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I Semester M.C.A. Degree Examination, June/July - 2023

**COMPUTER SCIENCE**

Data Structures

(CBCS Scheme Y2k20)

Paper : IMCA6

Time : 3 Hours

Maximum Marks : 70

**Instructions to Candidates:**

Part A:- Answer any Five questions

Part B:- Answer any Four questions

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

1. Define data structures. Discuss the classification of data structures.
2. Explain any four string handling Functions.
3. Write a program to find GCD of three numbers using recursion.
4. Define Linked list. Explain its types.
5. Evaluate the postfix Expression using stack.  
 $8\ 3\ 4\ +\ *\ 2\ /\ 3\ 5\ *\ -$
6. Write a short note on Topological sorting.
7. Write an algorithm for selection sort with an Example.
8. Explain different types of Hash function with an example.

**PART - B****II. Answer any Four questions. Each question carries Ten marks.**

9. a) Explain Asymptotic Notation (5)  
b) Explain string Matching algorithm with example. (5)
10. a) Write an algorithm for push and pop operation of a stack. (5)  
b) Convert the infix expression into postfix expression using stack.

 $((A+B) - C * (D/E)) + F$ 

(5)

[P.T.O.]

Dr. J. P. T.







11. a) Write an algorithm to insert an element to a circular queue. (5)
- b) Given the following traversal, draw a binary tree: (5)
- i) In order: 4 2 5 1 6 7 3 8  
Post order: 4 5 2 6 7 8 3 1
- ii) Preorder: A B D E G C F H  
Inorder: D B G E A H F C
12. Construct AVL tree for the following data (10)  
21, 26, 30, 9, 4, 14, 28, 18.
13. a) Explain Memory representation of Graph with example. (5)
- b) Discuss about Priority queue. (5)
14. Write down the steps for quick sort and show the tracing of the following list. (10)  
5, 3, 8, 1, 4, 6, 2, 7.
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I Semester M.C.A. Degree Examination, June/July - 2023

**COMPUTER SCIENCE**

Discrete Mathematics

(CBCS Y2k20 Scheme)

Paper : IMCA2

Time : 3 Hours

Maximum Marks : 70

**Instructions to Candidates:**

Answer any Five questions from Part - A.

Answer any Four questions from Part - B.

**PART - A**

Answer any Five questions. Each question carries Six marks. (5×6=30)

1. State and Prove De Morgan's Law.

2. Prove by Mathematical Induction that

$$1.2 + 2.3 + 3.4 + \dots + n(n+1) = \frac{n(n+1)(n+2)}{3}$$

3. Define Logical Equivalence Show that  $(P \leftrightarrow q) \Leftrightarrow (P \rightarrow q) \wedge (q \rightarrow P)$ 

4. State and Prove Pigeon - hole Principle.

5. Find relational matrix, digraph indegrees and outdegrees for the relation

$$R = \{(1,3), (2,1), (3,1), (3,4), (4,1), (4,2), (4,5), (5,3)\} \text{ defined on the set } A = \{1, 2, 3, 4, 5\}$$

6. IF  $P(A) = \frac{6}{11}$ ,  $P(B) = \frac{5}{11}$  and  $P(A \cup B) = \frac{7}{11}$  find(i)  $P(A \cap B)$ (ii)  $P(A/B)$ (iii)  $P(B/A)$ 

7. Explain different tree traversals with example.

[P.T.O.]





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8. Define the following terms with example

- a) Pseudo graph
- b) Complete graph
- c) Planar graph

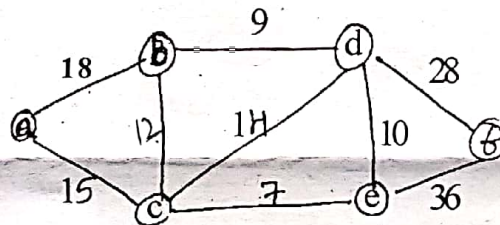
### PART - B

Answer any Four questions. Each question carries Ten marks.  $(4 \times 10 = 40)$

9. a) For any three sets A, B, C prove that  $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$  using Venn diagram.
- b) A survey of 500 television viewers of a sports channel produced the following information 285 watch cricket, 195 watch hockey, 115 watch football, 45 watch cricket and football, 70 watch cricket and hockey, 50 watch hockey and football and 50 do not watch any of the three games. Find
- i) How many viewers in the survey watch all three kinds of games?
  - ii) How many viewers watch exactly one of the sports? (5+5)
10. a) How many ways can the letters of the word ASSASSINATION be arranged so that all the S's are together?
- b) Find the middle terms in the expansion  $\left(\frac{x}{3} + 9y\right)^{10}$  (5+5)
11. a) Consider  $f: R_+ \rightarrow [4, \infty]$  given by  $f(x) = x^2 + 4$ . Show that f is invertible and find inverse of f.
- b) Prove that the compound proposition  $[(P \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (P \rightarrow r)$  is a Tautology (5+5)
12. a) Let a Pair of dice be thrown and the random variable X be the sum of the numbers that appear on the two dice. Find the mean, variance and standard deviation of X.
- b) An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers, the probability of an accident are 0.01, 0.03 and 0.05 respectively. One of the insured persons meets with an accident. What is the probability that he is a scooter driver? (5+5)



13. a) Two cards are drawn from a pack of 52 cards at random. What is the probability that it will be
- a diamond and a heart
  - a king or a queen
  - both are kings.
- b) Define Graph. Show that the sum of degrees of all the vertices of a graph is twice the no. of edges. (5+5)
14. a) Define Euler and Hamiltonian graph. Give an example of a graph which is Hamiltonian but not Eulerian and Vice versa.
- b) Find the minimum cost spanning tree for the below graph using kruskal's algorithm. (5+5)







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I Semester MCA. Degree Examination, June/July - 2023

COMPUTER SCIENCE

Object Oriented Programming

(CBCS Scheme Y2k20)

Paper- IMCA5

Time : 3 Hours

Maximum Marks : 70

*Instructions to Candidates:*

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

**SECTION - A**

Answer any Five questions. Each question carries Six marks.

1. Explain the principles of OOPS.
2. Explain with example constructors in Java
3. Difference between string class and string Buffer class. State with example any two methods of string Buffer class.
4. Explain briefly the following with examples.
  - a) Abstract Classes
  - b) Nested Classes
5. What are interfaces? How can multiple inheritance be implemented using interfaces?
6. Write a Java program that creates two threads. First thread displays "Hello" every two seconds and second thread displays "Good bye" every four seconds.
7. What are packages? How are packages created and used in Java?
8. Write a note on Lifecycle. Of an Applet.



**SECTION - B**

Answer any Four questions. Each question carries Ten marks.

9.
  - a) Explain the structure of a Java Program.
  - b) Write a Java Program to print the first in members of Fibonacci series. (5+5)

[P.T.O.]







10. a) What are static member data and static member method? Explain with example. (4)  
b) Briefly explain - final, finally, finalize (6)
11. Explain exception handling in Java (10)
12. Explain the two ways of creating threads in Java. (10)
13. Discuss the different stream classes in Java. (10)
14. Write short notes on: (5+5)  
a) Method overloading and method overriding  
b) Arrays and types of Arrays.
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**I Semester M.C.A. Degree Examination, June/July - 2023****COMPUTER SCIENCE****The Art of Computer Programming****(CBCS Scheme (Y2K20))****Paper : IMCA1****Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates:****Answer any Five questions from Part - A****Answer any Four questions from Part - B.****PART - A****Answer any Five questions. Each question carries 6 marks.****(5×6=30)**

1. Explain Asymtotic notations.
2. Write an algorithm to reverse the digits of an integer, check your algorithm for the input 4356.
3. Explain with example the formatted I/O functions in C.
4. Explain with examples the different forms of if statements.
5. Write a C program to remove duplicate elements from an unordered array.
6. Write a C Program for multiplying two matrices.
7. Explain two-way merge with an example.
8. Write the string matching algorithm and state its complexity.

**PART - B****Answer any Four questions. Each question carries 10 marks.**

9. a) Write an algorithm for coverting a decimal number to binary. **(5+5)**  
b) State with example any five string functions in C.
10. a) Write a recursive algorithm for generating  $n^{\text{th}}$  fibonacci number. **(5+5)**  
b) Explain the different looping constructs in C.

**[P.T.O.]**



11. a) Differentiate with example-call by reference and call by value. (6)  
b) Discuss with example command line arguments. (4)
12. a) Explain different types of arrays with examples. (5+5)  
b) What are pointers? Explain with example how pointer is used to reference array elements.
13. Write a C program for binary search and trace it for the following array. Take search value as 15. (10)  
2, 5, 6, 9, 11, 15, 18, 21.
14. Write Insertion sort algorithm. Trace the algorithm for the following array. (10)  
5, 2, 4, 6, 1, 3.





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I Semester M.C.A. Degree Examination, June/July- 2023

COMPUTER SCIENCE

Theory of Computation

(CBCS Y2k20 Scheme (2020-2021))

Paper : 1MCA4

Time : 3 Hours

Maximum Marks : 70

Instructions to candidates:

- 1) Answer any **Five** full questions from Part - A. Each question carries Six marks.
- 2) Answer any **Four** full questions from Part - B. Each question carries Ten marks.

**PART - A**Answer any **Five** of the following. Each question carries Six Marks.

(5×6=30)

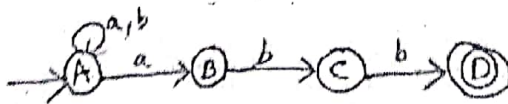
1. Define Finite Automata. Compare DFA, NFA with suitable examples.
2. Draw a DFA to accept strings of a's and b's ending with abb, and also show that strings bbabb, aaabb are accepted by the DFA.
3. What is Regular expression? Construct FA for the Regular expression  $00^* + 1$ .
4. Define Derivation Tree and also show that following grammar is ambiguous  $S \rightarrow aSbS / bSaS$ .
5. Define PDA? Explain PDA model with graphical representation.
6. What are Moore and Mealy machines? Explain Difference between them.
7. Define Turing Machine. Explain halting programming techniques for TM.
8. State and prove that the Union of two recursive languages is recursive.

**PART - B**Answer any **Four** full questions of the following. Each question carries Ten marks.

(4×10=40)

9. a) Convert the following NFA to equivalent DFA.

(7)



- b) Discuss the Applications of Finite Automata.

(3)



[P.T.O.]





10. a) Define CNF. Convert the following CFG to CNF

$S \rightarrow 0A|1B$

$A \rightarrow 0AA|1S|1$

$B \rightarrow 1BB|0S|0$

(7)

- b) Prove that the regular languages are closed under intersection. (3)

11. Define deterministic Pushdown Automata. Design PDA to accept the language  $L = \{WCW^R | W \geq 0 \text{ and } W \text{ contains a's and b's}\}$  and also verify if it is DPDA or NPDA. (10)

12. Define instantaneous descriptions for Turing machines. Obtain a Turing machine to accept the language  $L = \{0^n 1^n 2^n | n \geq 1\}$ . Show that the string  $W = 001122$  are accepted by TM. (2+6+2)

13. a) Show that  $L = \{0^n 1^n | n \geq 1\}$  is not regular. (5)

- b) Explain different types of TM. (5)

14. Write short note on:

- a) Universal languages (5)

- b) Context Sensitive Languages (5)