

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Computer Science Degree Examination, November 2022

MCS1C01 – Discrete Mathematical Structures

(2022 Admission onwards)

Time: 3 hours

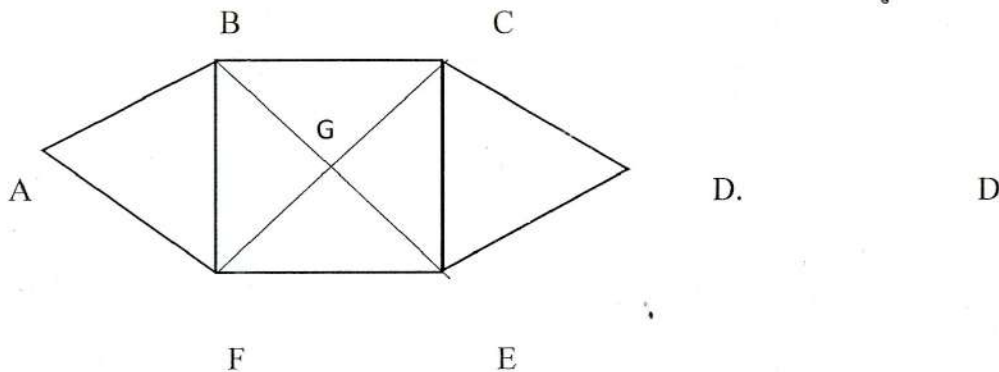
Max. Weightage : 30

PART A**Questions 1 to 7. Answer any four. Each questions carries two weightage.**

1. Discuss about the theory of inference for the statement calculus.
2. Show that $\neg P \wedge (\neg Q \wedge R) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$.
3. Explain equivalence of a relation.
4. Describe the principle of duality.
5. Define Subgroup and Cosets. Give examples.
6. Define semigroup and monoid.
7. Define spanning tree and cut-sets.

(4x2=8 weightage)**PART B****Questions 8 to 14. Answer any four. Each questions carries three weightage.**

8. Explain functionally complete set of connectives.
9. Discuss relation and their properties.
10. Describe distributive and complimented lattice.
11. Differentiate Homomorphism and Isomorphism with example.
12. Define function and component of function. List type of function.
13. Prove that every field is an integral domain.
14. Define Euler path and circuits. Find circuit in the following graph:

**(4x3=12 weightage)**

PART C

Questions 15 to 18. Answer any *two*. Each questions carries *five* weightage.

15. (a) Explain well-formed formulas and its associated rules.
(b) Explain free and bound variable with example.
16. (a) Explain rings and fields
(b) State and prove Pigeon Hole Principle.
17. Discuss about Hasse diagram.
18. Explain about Prim's Algorithm.

(2x5=10 weightage)

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Computer Science Degree Examination, November 2022

MCS1C02 – Advanced Data Structures

(2022 Admission onwards)

Time: 3 hours

Max. Weightage : 30

SECTION A

Questions 1 to 7. Answer any four. Each questions carries two weightage.

1. Define Data Structure.
2. Define Skew Heap
3. Differentiate data type and data structure.
4. Explain queue data structure.
5. Explain dynamic lists.
6. Define graphs.
7. What is BST?

(4x2=8 weightage)

PART B

Questions 8 to 14. Answer any four. Each questions carries three weightage.

8. Compare and contrast array and list.
9. What is meant by Sparse matrix. Explain.
10. What is meant by the 'address formula'? Explain.
11. Take any four sorting algorithms and compare their time complexities.
12. What is meant by hashing? Explain its relevance.
13. What are heap trees? Explain different types of heap trees.
14. What is RED-BLACK Tree? Give properties.

(4x3=12 weightage)

PART C

Questions 15 to 18. Answer any two. Each questions carries five weightage.

15. Derive an expression for the address formula of a n-dimensional array.
16. Explain Stack and queue with examples. Give algorithms for their operations.
17. Explain various hashing techniques.
18. Explain any one for each of sorting algorithms for which time complexity is $O(n^2)$ and $O(n \log n)$

(2x5=10 weightage)

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Computer Science Degree Examination, November 2022

MCS1C03 – Theory of Computation

(2022 Admission onwards)

Time: 3 hours

Max. Weightage : 30

PART A (Answer any four. Each question carries *Two* weightage.)

1. Explain Mathematical Induction for giving proofs.
2. What is Star operation on Languages?
3. Whether the languages accepted by a DFA and NFA are same? Justify your answer.
4. Briefly explain the concept of regular expressions and different operators of regular expressions.
5. Explain multi-tape Turing Machine.
6. Give DFA for the language $L = \{\text{all strings with not more than two 'a' s; } \Sigma = \{a, b\} \}$.
7. Compare recursive and recursively enumerable languages.

(4 x 2 = 8 weightage)

PART B (Answer any four. Each question carries *Three* weightage.)

8. Briefly explain the PCP problem.
9. State and prove the equivalence of DFA and NFA.
10. Explain the pumping lemma for context free sets.
11. Distinguish between P and NP class of problems.
12. Convert the grammar in to CNF.
$$S \rightarrow bS \mid bB \mid ab$$
$$B \rightarrow cBd \mid cd$$
13. Construct a PDA for the language $L = \{ 0^n 1^n \mid n \geq 1 \}$.
14. Explain Linear Bounded Automata.

(4 x 3 = 12 weightage)

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Computer Science Degree Examination, November 2022

MCS1C03 – Theory of Computation

(2022 Admission onwards)

Time: 3 hours

Max. Weightage : 30

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(4 x 3 = 12 weightage)

PART C (Answer any two. Each question carries Five weightage)

15. What is a regular expression? Draw the NFA with epsilon moves for the regular expression $01^*(0+1)^*$.

16. Construct DFA equivalent to the given NFA

$$M = (\{q_0, q_1\}, \{0,1\}, \delta, q_0, (\{q_1\}))$$

$$\text{Where } \delta \text{ is: } \delta(q_0, 0) = \{q_1\}; \quad \delta(q_0, 1) = \{q_0, q_1\};$$

$$\delta(q_1, 0) = \Phi; \quad \delta(q_1, 1) = \{q_1\};$$

17. Explain Turing machine. Design a TM to accept the language $L = \{1^n 2^n 3^n \mid n \geq 1\}$.

18. Explain the Halting problem. Show that it is undecidable problem.

(2 x 5 = 10 weightage)

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Computer Science Degree Examination, November 2022

MCS1C04 – The Art of Programming Methodology

(2022 Admission onwards)

Time: 3 hours

Max. Weightage : 30

Part A**Answer any 4 questions. Each question carries 2 weightage**

1. Differentiate between “call by value” and “call by reference”.
2. Mention the difference between character array and integer array.
3. What is a pointer? Explain declaration of a pointer.
4. Explain command line argument.
5. Distinguish between scope and visibility of variables.
6. How switch case works without break statement.
7. Define algorithm. Write algorithm for finding factorial of a number.

(4 x 2 = 8 weightage)**Part B**

8. Answer any 4 questions. Each question carries 3 weightage
9. Explain Top-down design approach.
10. Write a recursive function to find the factorial of a number.
11. Explain about type conversion in C.
12. What is constant? Explain different constants in C.
13. Write an algorithm and flowchart to find whether the given number is prime or not.
14. Compare switch and if statements.
15. Write a program to find sum of the individual digits of a given number.

(4 x 3 = 12 weightage)**Part C****Answer any 2 questions. Each question carries 5 weightage**

16. Explain in detail various branching statements, with suitable examples.
17. Explain in detail various data types in C including all subtypes and example. Show the ranges whenever applicable.
18. Draw a flow chart to count no. of characters, spaces, lines, words of a file and write C program
19. Two files TXT1 and TXT2 contain sorted lists of integers. Develop a program to produce a third file DATA which holds a single sorted, merged list of these two lists. Use command line arguments to specify the file names.

(2 x 5= 10 weightage)

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Computer Science Degree Examination, November 2022

MCS1C05 – Computer Organization and Architecture

(2022 Admission onwards)

Time: 3 hours

Max. Weightage : 30

PART A

Questions 1 to 7. Answer any four. Each questions carries two weightage.

1. What are shift registers?
2. Why are Ripple counters called so?
3. How will you convert a Full adder to a Subtractor?
4. Explain steps in a Memory READ operation.
5. Explain SP and AX register in 8086.
6. Describe DMA.
7. List different types of RAM and ROM.

(4x2=8 weightage)

PART B

Questions 8 to 14. Answer any four. Each questions carries three weightages.

8. Explain floating point number representation.
9. Explain Booth's algorithm.
10. With a block diagram illustrate working of array multiplier.
11. Identify the steps in execution of branch instruction.
12. Discuss vectored interrupts and interrupt nesting.
13. Write a note on timing diagram.
14. Explain program I/O and interrupt driven I/O.

(4x3=12 weightage)

PART C

Questions 15 to 18. Answer Anytwo. Each questions carries five weightage.

15. With a help of a block diagram explain two bus and three bus organisation of processor.
16. (a) What is a counter? Explain design of a 3-bit binary counter.
(b) Discuss different scheme for integer representation.
17. Explain in detail organisation and working of a virtual memory system.
18. Give a detail account of microprogrammed and hardwired control unit.

(2x5=10 weightages)