

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Degree Examination, November 2018

MCSIC01 – Discrete Mathematical Structures

(2016 Admission onwards)

Max. Time: 3 hours

Max. Weightage: 36

Part A**Answer all questions.****Each question carries 1 weightage.**

State Pigeon-hole principle.

What is a well formed formula?

Negate the following sentences.

a. Ottawa is a small town.

b. No city in Canada is clean.

Define POSET with example.

Differentiate function and relation.

Define minimal spanning tree.

Define Euler circuit.

State Lagrange's Theorem.

Define Modus ponens and Modus tollens.

Draw a Hasse diagram that is also a lattice.

What is an invertible function?

Give an example for a relation which is reflexive and transitive but not symmetric.

(12 x 1 = 12 weightage)**Part B****Answer any six questions.****Each question carries 2 weightage.**

Show that if 10 colours are used to paint 101 buildings, then at least 11 buildings have the same colour.

Define homomorphism with an example.

Write the following predicates in symbolic form.

a. "Someone in your school has visited Agra".

b. "Every one has exactly one favourite language".

Define the connectives with examples.

a. Conjunction.

b. Disjunction.

c. Conditional.

d. Biconditional.

17. Find the inverse of the function $y = x^3 + 2$.
18. Find the sum of product expansion for the function $f(x, y, z) = (x + y) \bar{z}$.
19. Let D_{42} be the set of divisors of 42. Draw the Hasse diagram of D_{42} and find the complement of each element in D_{42} .
20. Given that f and g are two functions defined over set of real numbers R as $f(x) = 1+x$ and $g(x) = 1-x$. Then find $f \circ g$ and $g \circ f$.
21. Reduce the following formula to equivalent principal disjunctive normal form.
- a. $(P \wedge Q) \vee (\bar{P} \vee Q \vee R)$ b. $(P \rightarrow Q) \wedge (Q \rightarrow R)$

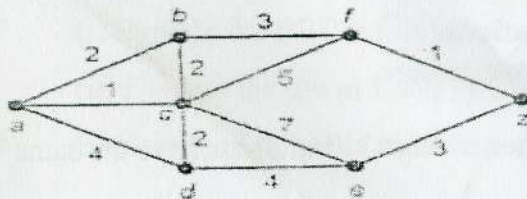
(6 x 2 = 12 weightage)

Part C

Answer any *three* questions.

Each question carries 4 weightage.

22. a. Prove that a tree with n vertices has $n-1$ edges.
 b. Test the validity of the following argument.
 If I study, I will not fail in the examination.
 If I do not watch TV in the evenings, I will study.
 I failed in the examination.
 Therefore, I must have watched TV in the evenings.
23. Describe the following with examples.
 a. Onto function. b. One-to-one function.
 c. Into function. d. One-to-one onto function.
24. A Boolean algebra is a complemented, distributive lattice. Can you justify it?
25. Define Ring. Prove that the set $G = \{0, 1, 2, 3, 4\}$ is a ring with the operation of addition and multiplication modulo 5.
26. Find the shortest path between the vertices a and z in the graph shown below using Dijkstra's algorithm.



27. Suppose 100 out of 120 Computer Science students study at least one of the following languages: French, German and Russian. It is given that 65 students study French, 45 students study German, 42 students study Russian, 20 students study French and German, 25 students study French and Russian and 15 students study German and Russian. Find the number of students who study
- a. Only French and German, but not Russian. b. Only French and Russian, but not German.
 c. Only German and Russian, but not French. d. Only French.
 e. Only Russian. f. None of the three languages.

(3 x 4 = 12 weightage)

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Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Degree Examination, November 2018

MCSIC04 – The Art of Programming Methodology

(2016 Admission onwards)

Max. Time: 3 hours

Max. Weightage: 36

Part A

Answer all questions. Each question carries 1 weight

1. Explain conditional operators in C .
2. Outline the conventions to be followed while preparing flowcharts.
3. Write an algorithm to find the biggest of three numbers using only two simple selection statements.
4. Differentiate between call by reference and call by value.
5. What is the output of the following program segment:

```

unsigned char c;
for (c=0; c <= 127; j++)
printf(“%d”, c);

```

6. Explain any two string handling functions.
7. Write a recursive function to print “CSSIC04”.
8. Distinguish between “C” and ‘C’.
9. Identify the arithmetic operators allowed on pointers.
10. Explain the formatted input functions for reading values from a file.
11. Discuss about the basic control structures used to construct a flowchart.
12. What is the use of #include directive?

(12 x 1 = 12 weightage)

Part B

Answer any 6 questions.

Each question carries 2 weight

13. Discuss a problem (with flowchart) in which the principle of forming the i^{th} term from $(i-1)^{\text{th}}$ term is applied.

14.

- a. Illustrate the use of **typedef** and **enum** declaration.
- b. Illustrate the flowchart for automatic counter with a suitable example.

15. Write a program to accept a number (eg 1234) and display the output as :

```
1 2 3 4
2 3 4
3 4
4
```

16. Explain about formatted output operation.

17.

- a. What is meant by top tested and bottom tested loops?
- b. Write a program to illustrate a top tested loop where the numbers of iterations are not known in advance.

18. Write a program to sort a list of names.

19. Discuss about returning an array from a function.

20. Explain how input data can be validated when scanf() is used for input.

21. How a pointer to a function is defined.

(6 x 2 = 12 weightage)

Part C

Answer any 3 questions.

Each question carries 4 weight

22.

- a. Design two algorithms to find the Fibonacci series
(i) by using three variables (ii) by using two variables.
- b. Compare the algorithms for (i) and (ii).

23.

- a. Explain about relational and logical operators in C.
- b. Write a program to display the contents of a linked list.

24. Explain about preprocessors in C.

25.

- a. Discuss about operations on files.
- b. Write a program that compares two files.

26. Explain how functions can be implemented in C.

27.

- a. Design flowchart to do the following operations on a square matrix:
(i) read input from the user row wise, (ii) print the output in matrix form, and
(iii) transpose the matrix. Use functions for all these operations.
- b. Write an algorithm to find the factorial of a number and write C program to implement the algorithm .

(3 x 4 = 12 weightage)

FAROOK COLLEGE (AUTONOMOUS)
 First Semester M.Sc. Degree Examination, November 2018
 MCS1C05 – Computer Organization and Architecture
 (2015 – Admission onwards)

Max. Time: 3 hours

Maximum : 36 Weightage

PART - A**Answer all questions. Each question carries 1 weightage.**

1. Differentiate combinational and sequential circuits.
2. Show how half adder circuit is used to make a full adder.
3. Show a single precision IEEE representation of floating point numbers.
4. Differentiate stack and queue.
5. What is a microinstruction?
6. Subtract 31 from 17 using two's complement method.
7. Represent the decimal values 75, -47, -119 using 2's complement and sign and magnitude.
8. What is the need for cache memory and virtual memory in a computer system?
9. Arrange the following memories according to their performance in ascending order:
SRAM, DRAM, CPU Registers, USB flash memory, Magnetic memory.
10. What is privilege exception?
11. List the different hardware interrupts of 8085 processor and their priorities.
12. What is pipeline architecture?

(12 x 1 = 12 weightage)**PART - B****Answer any six questions. Each question carries 2 weightage**

13. Simplify using Boolean algebra $(BC' + A'D)(AB' + CD')$
14. With the help of circuit diagram explain the design of a full adder circuit and discuss how it is used for making 4 bit parallel adder.
15. What is stack frame and where and how is it used?
16. Explain execution of a complete instruction Add (R3),R1 with control sequence.
17. Using manual methods, perform the operations $A \times B$ and A/B on the 5 bit unsigned numbers $A = 10101$ and $B = 00101$.
18. With the help of a schematic diagram explain the SDRAM circuit.
19. Discuss the different types of unconditional jump instructions in 8086 processors.
20. What are the different types of interrupts in 8086 processor? Briefly discuss them.
21. Draw the internal architecture of 8051 microcontroller mark the parts.

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

22. What is universal shift registers? With the help of circuit diagram explain all the modes of operations in a 7495IC?
23. With the help of diagram explain the Microprogram control and its use. Discuss the different types of microinstructions.
24. Discuss the Bit-pair recoding scheme in fast multiplication with the help of examples.
25. Explain the virtual memory address translation scheme using the diagram.
26. Explain the 8085 architecture with the help of the internal block diagram.
27. Explain the synchronous Bus and asynchronous bus operations with the help of timing diagrams.

(3 x 4 = 12 weightage)

FAROOK COLLEGE (AUTONOMOUS)
 First Semester M.Sc. Degree Examination, November 2018
 MCS1C03 – Theory of Computation
 (2015 – Admission onwards)

Max. Time: 3 hours

Maximum : 36 Weightage

PART A*Answer all questions. Each question carries 1 weightage.*

1. Define Finite Automata?
2. Define Symbol and Alphabet.
3. Define Deterministic PDA.
4. Give DFA for the language $L = \{a^n b^m ; n \geq 1, m \geq 2\}$.
5. Define regular grammar.
6. Give NFA for the language $L = \{ab^2wb^3 : w \in \{a,b\}^*\}$.
7. Define Turing machine.
8. Which are the different operations permitted on Languages?
9. Define Type 3 grammar.
10. Whether the languages accepted by a DFA and NFA are same? Justify your answer.
11. Define context free grammar.
12. What do you mean by 'closure property of a language'?

(12 x 1 = 12 weightage)**PART B***Answer any six questions. Each question carries 2 weightage.*

13. Distinguish between DFA and NFA with the help of examples.
14. What is an ambiguous grammar? Give an example.
15. Give DFA for the language
 $L = \{\text{all strings with not more than three 'a' s; } \Sigma = \{a, b\}\}$.
16. Briefly explain the concept of regular expressions and different operators of regular expressions.
17. Describe CNF and the steps involved to convert a grammar to CNF using suitable example.
18. Construct PDA for the language $L = \{0^n 1^n | n \geq 1\}$.
19. Convert the given grammar in to GNF.
 $S \rightarrow aSbB | ab$
 $B \rightarrow cBd | cd$
20. Write notes on NP completeness.
21. Briefly explain the PCP problem.

(6 x 2 = 12 weightage)**PART C***Answer any three questions. Each question carries 4 weightage.*

22. State and prove the equivalence of DFA and NFA.
23. Check whether the language, $L = \{a^n b^n | n \geq 1\}$ is regular or not. Justify your answer.
24. State and prove closure properties of CFLs (for union, concatenation, star, intersection and complement).
25. Explain the pumping lemma for context free language.
26. Design a TM to accept the language
 $L = \{a^n b^n c^n | n \geq 1\}$.
27. Explain the Halting problem. Show that it is undecidable.

(3 x 4 = 12 weightage)

FAROOK COLLEGE (AUTONOMOUS)
First Semester M.Sc. Degree Examination, November 2018
MCS1C02 – Advanced Data Structures
(2015 – Admission onwards)

Max. Time: 3 hours

Max. 36 Weightage

PART - A

Answer *all* questions. Each question carries a *weightage* of *one*.

1. Define recursion?
2. What is meant by a *reference count*?
3. Define a *Stack*.
4. What is meant by *threaded* binary tree?
5. Define a *B-Tree*.
6. Define *Big Oh* notation.
7. What is meant by *BST*? Give an example.
8. What is meant by a *Hash* function?
9. Define a *Generalized List*?
10. What is meant by *m-way* search tree? Give an example.
11. Define a *Dynamic Tree Table*.
12. What is meant by a *heap* tree?

12 x 1 = 12 *Weightage*

PART - B

Answer *any six* questions. Each question carries a *weightage* of *two*.

13. What is meant by data structure? What are the various types of data structures?
14. Explain the tradeoff between *time* and *space* complexity with a suitable example.
15. What is meant by a *sparse* matrix? Give its representation and write an algorithm to find the transpose of a *sparse* matrix.
16. Distinguish between column major and row major representation.
17. Briefly explain shared lists and recursive lists.
18. Represent a multi-variable polynomial using *GL*?
19. Write algorithm for in-order, pre-order and post order traversals.
20. Write a detailed note on leftist heaps.
21. What is meant by *treap*? Give an example.

6 x 2 = 12 *Weightage*

PART - C

Answer any three questions. Each question carries a weightage of 4.

22. a) What are the properties of an algorithm? Explain.
b) Explain any two applications of *stack* with suitable examples.
23. a) Differentiate *linear queue* and *circular queue*. Explain algorithms for *circular queue* operations.
b) What are the *prefix* and *postfix* form of the given expressions:
(i) $A * B / C$
(ii) $A / B ** C + D * E - A * C$
(iii) $A * (B + C) / D - G$
24. (a) Develop the tree from the given data:
(i) *pre-order sequence*: A B C D E F G H I
(ii) *in-order sequence*: B C A E D G H F I
(b) Create an AVL tree from the given data:
March, May, November, August, April, January, December, July, February, June, October, September.
25. Explain *Prim's* algorithm for finding minimal spanning tree with a suitable example.
26. Differentiate *collision* and *over flow* in the context of hashing. Explain any two over flow handling methods.
27. Define a *splay* tree. Explain algorithm for insertion and deletion operation in *splay* tree.

3 x 4 = 12 Weightage