11

1N20032 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Computer Science Degree Examination, November 2020

MCS1C01 – Discrete Mathematics Structures

(2020 Admission onwards)

ıe: 3 hours Max. Weightage : 30

PART A

ıestions 1 to 7. Answer any *four*. Each question carries *two* weightage.

1. Define a) Power Set b) Symmetric differences of two sets
2. Construct the truth table for $\neg(P \wedge Q) \Leftrightarrow (\neg P \vee \neg Q)$
3. State and prove Pigeon hole principle.
4. Define Lattice and Lattice Homomorphism
5. a) State Lagrange's theorem b) Define abelian group
6. Define Eulerian Circuits and Hamiltonian Circuits
7. Explain the term connectedness related with directed graph and undirected graph

(4 x 2 = 8 weightage)

PART B

ıestions 8 to 14. Answer any *four*. Each question carries *three* weightage

8. Show that $((P \vee Q) \wedge \neg(\neg P \wedge (\neg Q \vee \neg R))) \vee (\neg P \wedge \neg Q) \vee (\neg P \vee \neg R)$ is a tautology
9. Explain Inverse function. Show that the functions $f(x) = x^3$ and $g(x) = x^{1/3}$ for $x \in R$ are inverse of one another
10. Let $\langle L, \leq \rangle$ be a lattice in which $*$ and $\oplus$ denote the operations of meet and join respectively. For any $a, b \in L$,

    Show that $a \leq b \Leftrightarrow a * b = a \Leftrightarrow a \oplus b = b$

11. a) Explain rings and fields

b) What is meant by Normal form ? Explain with example CNF and DNF

12. Prove that tree with n vertices has n-1 edges

13. Show that in any Boolean algebra , $(a+b)(a'+c) = ac + a'b + bc$

14. Let $x = \{1,2,3,4,5,6,7\}$ and $R = \{ \langle x, y \rangle \mid x-y \text{ is divisible by } 3\}$. Show that R is an equivalence relation. Draw the graph of R

(4 x 3 = 12 weightage)

PART C

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

15. Derive the principal disconjuctive normal form of

$P \rightarrow ((P \rightarrow Q) \wedge \neg(\neg Q \vee \neg P))$

16. Explain Dijikstra's shortest path algorithm, with an example

17. Let A be a given finite set and p(A) its power set. Let $\subseteq$ be the inclusion relation on the elements of P(A) . Draw Hasse diagram of $\langle p(A), \subseteq \rangle$ for

a) $A = \{a\}$ b) $A = \{a,b\}$ c) $\{a, b, c\}$ d) $\{a,b,c,d\}$

18. Show that subgroup of a cyclic group is itself a cyclic group

(2 x 5 = 10 weightage)

2M1N20033 (Pages : 1) 12 Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Computer Science Degree Examination, November 2020

MCS1C02 – Advanced Data Structures

(2020 Admission onwards)

Time: 3 hours Max. Weightage : 30

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

1. Explain *asymptotic* notations for algorithm analysis.
2. Explain Fibonacci Search.
3. Define *stack*. Give algorithm for push () and pop () operations.
4. Explain how *circular queue* can be implemented using an array?
5. Compare and contrast *singly-linked* list and *doubly-linked* list.
6. What is Digital Trie? Explain.
7. Define and explain queue.

(4 x 2 = 8 weightage)

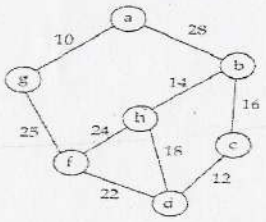
PART B(Answer any *four*. Each question carries *Three* weightage.)

8. Define *sparse matrix*. Write an algorithm to find sum of two sparse matrices.
9. What is a *Binary Search Tree*? Explain algorithm for deleting an element from ***BST***.
10. Define an ***AVL*** tree. Why it is called so? Explain insertion and deletion operations in AVL tree with suitable examples.
11. What is ***Splay Tree***? What are its properties? Explain various cases of balancing a ***Splay Tree***.
12. Explain Hashing and various methods for hashing. Also explain how collisions can be handled?
13. Explain Heap sort algorithm. Derive an expression for the time complexity of heap sort.
14. Perform *Insertion Sort* on the given data and show each steps. 5, 80, 20, 60, 40, 10, 77, 19, 11, 90

(4 x 3 = 12 weightage)

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

15. Explain quick sort algorithm. Derive an expression for the time complexity of quick sort.
16. Perform heap sort on the given data. Show each steps. 5, 80, 20, 60, 40, 10, 77, 19, 11, 90
17. What is RB Tree? What are its properties? Explain various cases of balancing in RB Tree.
18. For the following weighted graph find the minimum spanning tree using ***Kruskal's*** algorithm.



(2 x 5 = 10 weightage)

13

2M1N20034 (Pages : 1) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Computer Science Degree Examination, November 2020

MCS1C03 – Theory of Computation

(2020 Admission onwards)

Time: 3 hours Max. Weightage : 30

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

1. Explain Finite Automata and its working.
2. Which are the different operations permitted 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. Define Type 3 grammar.
6. Give DFA for the language L = {all strings with not more than three 'a' s; $\Sigma = \{a, b\}$ }.
7. What do you mean by recursively enumerable language.

(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 regular language.
11. Distinguish between P an NP class of problems.
12. Convert the grammar in to CNF.

    S→aSbB | ab

    B →cBd | cd

13. Construct a PDA for the language $L = \{ a^n b^n \mid n \geq 1\}$.
14. Explain LBA.

(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 100*(0+1)*.
16. Construct DFA equivalent to the given NFA

    M = ({q0,q1},{0,1},δ, q0, ({q1})

    Where δ is : $\delta(q0, 1) = \{q0, q1\}$; $\delta(q0, 0) = \{q1\}$;

    $\delta(q1, 1) = \Phi$; $\delta(q1, 1) = \Phi$;

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.

(2 x 5 = 10 weightage)

14

2M1N20035 (Pages : 1) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Computer Science Degree Examination, November 2020

MCS1C04 – The Arts of Programming Methodology

(2020 Admission onwards)

Time: 3 hours Max. Weightage : 30

Section A

Answer any 4 questions. Each question carries 2 weightage

1. List out and discuss characteristic of a good program
2. Explain any five features of C
3. Describe various steps involves to execute a C program
4. Write a note on program testing and debugging.
5. Explain top-down design approach.
6. Explain different data type available In C with suitable example.
7. What you mean by conditional operator. Write suitable program code to illustrate it.

(4 x 2 = 8 weightage)

Section B

Answer any 4 questions. Each question carries 3 weightage

8. Write C Program to print the size and the data types in C and its range.
9. What you mean by recursive function. How it help programmers. Illustrate with suitable example
10. Differentiate between function definition and function prototype
11. Distinguish between Global and local variable with example.
12. Explain different type of errors with suitable example.
13. Distinguish between call by value and call by reference
14. Draw flow chart to display and count vowels in line of text.

(4 x 3 = 12 weightage)

Section C

Answer any 2 questions. Each question carries 5 weightage

15. Explain branching statement available in C with suitable program code
16. Write C program to list prime factors of an integer.
17. Explain scope and life time of variable with suitable program statement.
18. Write a note on different storage classes available in C with example.

(2 x 5 =10 weightage)

15

2M1N20036 (Pages : 1) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Computer Science Degree Examination, November 2020

MCS1C05 – Computer Organization and Architecture

(2020 Admission onwards)

Time: 3 hours Max. Weightage : 30

PART A

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

1. Explain 2 bit ripple counter.
2. What is addressing mode?
3. What are the steps in executing a complete instruction?
4. What is micro programmed control?
5. Draw and explain 1 bit ALU.
6. What is the concept behind fast adder? Does it increase hardware requirements?
7. Draw memory hierarchy and briefly explain.

(4 x 2 = 8 weightage)

PART B

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

8. Draw and explain 2 to 4 line multiplexer.
9. Explain with diagram a synchronous decade counter
10. Explain how data transfer takes place between processor and I/O device in program controlled I/O technique.
11. Explain Booth's algorithm.
12. Implement a 2 bit fast adder.
13. What is 2-way set associative cache?
14. Explain hardware interrupts of 8086.

(4 x 3 = 12 weightage)

PART C

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

15. Briefly explain how virtual memory is implemented with paging..
16. Explain FP addition using hardware components.
17. Implement a 3 bit synchronous up/down counter.
18. Explain programmable interrupt controller (PIC).

(2 x 5 = 10 weightage)