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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Degree Examination, November 2017

MCS1C01 – Discrete Mathematical Structures

(2017 Admission onwards)

Time: 3 hours   Max. Weightage: 36

Part A

Answer all questions.

Each question carries 1 weightage

1. Construct the truth table for $\rceil(P \wedge Q) \Leftrightarrow (\rceil P \vee \rceil Q)$

2. Discuss on free and bound variables

3. State Pigeon hole principle.

4. Define Partially ordered set.

5. Let X={1,2,3} and f, g, h, and s be functions from X to X given by

   f={(1,2), (2,3) ,(3,1)}, g={(1,2),(2,1),(3,3)}, h={(1,1) , (2,2), (3,1)}, s={(1,2),(2,2), (3,3)}

   find   a) f.g;   b) g.f ;   c) s.g;   d) s.s

6. Define Lattice Homomorphism.

7. Explain Field with examples.

8. Define Subgroup. Give example.

9. Explain integral domain.

10. Explain minimal spanning tree.

11. Explain Hamiltonian circuit.

12. Define Planar graphs.

(12 x 1 = 12 weightage)

Part B
Answer any six questions.
Each question carries 2weightage

13. Show that $(x) (P(x) \rightarrow Q(x)) \wedge (x) (Q(x) \rightarrow R(x)) \Rightarrow (x) (P(x) \rightarrow R(x))$

14. Explain equivalence relation with example.

15. Discuss on different types of functions.

16. Explain different logical connectives used in propositional logic

17. Explain the matrix and digraph representation of a relation with examples.

18. Explain Permutation groups

19. Write Kruskal's algorithm

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

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

(6 x 2 = 12 weig

Part C
Answer any three questions.
Each question carries 4weightage

22. 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.

23. Let A be the set of factors of a particular positive integer m and let $\leq$ be the relation divides

   $\leq = \{(x,y)$ such that $x \in A \wedge y \in A \wedge (x$ divides $y)\}$

   Draw Hasse diagrams for a) m =2; b) m=6; c) m=30 d) m=120 e) m =12 f) m=45

24. Discuss on Lagrange's theorem.

25. Prove that if G is a finite group of order n with H a subgroup of order m, then m divides n.

26. Obtain the principal conjunctive normal form of the formula S given by

   $(\neg P \rightarrow R) \wedge (Q \leftrightarrow P)$

27. Explain Prim's algorithm with example.

(3 x 4 = 12 we

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Degree Examination, November 2017

MCS1C02 – Advanced Data Structures

(2017 Admission onwards)

ax. Time: 3 hours   Max. Weightage: 36

Part A

Answer all *questions*

Each question carries 1 weightage

What is Abstract Data Type?

What do you mean by time complexity and space complexity of an algorithm?

List the advantages of linked lists over arrays.

What are the important operations that can be performed with AVL Tree.

List out few application of tree data structure.

What is a priority queue?

Define recursion.

What are the properties of a B tree.

Define RB tree.

What is hash function.

Give two properties of splay tree.

What is a binomial heap?

(12 x 1 = 12 weightage)

Part B
Answer any six *questions*
Each question carries 2 weigtage

13. Explain how a stack can be implemented using a array

14. List the advantages and disadvantages of a circular linked list.

15. Analyze the time complexity of merge sort algorithm.

16. Define inorder, preorder, postorder, level order tree traversal with examples.

17. Write an algorithm which deletes the given data in a binary search tree.

18. Explain Dijkstra's algorithm for finding shortest path.

19. Perform heap sort on the data : 23, 54, 12, 66, 87, 35, 16, 60, 23, 75

20. Write the steps for insertion and deletion in min heaps

21. Discuss the quadratic probing method.

(6 x 2 = 12 weighta

Part C
Answer any three *questions*
Each question carries a weigtage of 4

22. Convert ((A – (B + C)) * D) / (E + F) into postfix form.

23. Give the time complexity of different sorting algorithms in different cases.

24. What is the pre requisite to apply binary search in an array? Explain with example.

25. Write an algorithm to insert a data item in a circular queue.

26. Create a leftists heap from the given data:

    23, 50, 80, 12, 17, 66, 88, 25, 100, 35

27. Explain the implementation of hash table.

(3 x 4 = 12 weight

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
First Semester M.Sc Degree Examination, November 2017
MCS1C03 – Theory of Computation
(2017 Admission onwards)

Max. Time: 3 hours   Max. Weightage: 36

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

1. Define Automata ?

2. Explain the concepts of Alphabet, Strings and Languages.

3. Define PDA.

4. Give DFA for the language

   $L = \{a^m b^n ; n \geq 1 , m \geq 2 \}$.

5. Define regular grammar.

6. Give NFA for the language

   $L = \{ab^3 wb^2 : w \in \{a,b\}^* \}$.

7. Define decidable problem.

8. Which are the different operations permitted on Languages?

9. What it means by 'closed under a particular closure property'?

10. Whether the languages accepted by a DFA and NFA are same? Justify your answer.

11. Define CNF and GNF.

12. Define Type 2 grammar.

(12 x 1 = 12 weightage)

Part B
Answer any six questions.
Each question carries 2 weightage.

13. Differentiate between recursive and recursively enumerable languages.

14. Give the different classes of Formal languages as mentioned in Chomsky hierarchy.

15. Give DFA for the language

$$L = \{\text{all strings contains more than two 'b' s and one 'a'}; \Sigma = \{a, b\}\}$$

16. Distinguish between Deterministic PDA (DPDA) with Nondeterministic PDA (NPD

    Whether the languages accepted by these two are same? Explain with suitable examp

17. Construct an NFA for the regular expression $ab^* (a + b)$.

18. What is an LBA ?

19. Show that 'cfl' is not closed under intersection.

20. What is the need for identifying NP complete problems?

21. Briefly explain the PCP problem with one example.

(6 x 2 = 12 weigh

Part C
Answer any three questions.
Each question carries 4 weightage.

22. Give the algorithm for converting an NFA to an equivalent DFA.

23. Check whether the language

$$L = \{ a^p \mid p \text{ is a prime number} \} \text{ is regular or not. Justify your answe}$$

24. Define PDA and its working in details. What is meant by a PDA accepting a langua
    a. empty stack.
    b. final state.

25. Using pumping lemma, show that the language $L = (a^n b^n c^n \mid n \geq 1)$ is NOT a co

    free language.

26. Design a TM to accept the language

$$L = \{ 1^n 2^n 3^n \mid n \geq 0 \}.$$

27. Explain any one undecidable problem and prove the same.

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Degree Examination, November 2017

MCS1C04 – The Art of Programming Methodology

(2017 Admission onwards)

Time: 3 hours　　　　　　　　　　　　　　　　Max. Weightage: 36

Part A
Answer all questions.
Each question carries 1 weightage

1. What is a flow chart? Explain with an example.

2. Explain the concept of structured programming.

3. How to define symbolic constants? Give example.

4. What is a variable? How it is formed?

5. What do you mean by type conversion?. Expain.

6. What is nested loop? Give example.

7. What is an array? How to access array elements?.

8. What is the use of gets and puts?

9. How to pass an array to a function?

10. What is the scope of a variable?

11. Explain array of pointers with an example.

12. What is random access file?

(12 x 1 =12 weightage)

Part B
Answer any six questions.
Each question carries 2 weightage

13. Write an algorithm to find the factorial of a number.

14. Write a program to display odd numbers up to n.

15. Explain basic data types in C.

16. What is two dimensional arrays? How it is declared and accessed?

17. Distinguish between break and continue statement.

18. Explain string handling functions in C.

19. Explain different storage classes in C with example.

20. Differentiate between structure and union.

21. What is dynamic memory allocation? Explain with example.

(6 x 2 =12 weighta

Part C
Answer any three questions.
Each question carries 4 Weightage

22. Explain different operators in C.

23. What is a loop? What are different types of loop?

24. Explain the use of pointers in C with examples.

25. Write a program to sort an array of numbers in ascending order.

26. Write a program to copy one string another without using strcpy function.

27. Write a program to generate Fibonacci sequence up to n.

(3 x 4 = 12 weight

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
First Semester M.Sc Degree Examination, November 2017
MCS1C05 – Computer Organization and Architecture
(2017 Admission onwards)

Time: 3 hours   Max. Weightage: 36

Part A
Answer all Questions.
Each Question carry one weightage

1. How codes are used to detect error? Mention two such binary codes.
2. Discuss the need for multiplexer and demultiplexer circuits in communication.
3. Show a double precison IEEE representation of floating point numbers.
4. Discuss the role of assembler directives in a program.
5. What is the advantage of field encoded microinstructions in a microprogram controlled processor?
6. Illustrate with an example of how shift and add can be used for multiplication.
7. What is is the logic behind the use of adders for subtraction?
8. What is the need for cashe memory and virtual memory in a computer system?
9. Discuss the hierarchy in the memory organization.
10. Differentiate precise exception and imprecise exception?
11. How does pipeline architecture improve performance?
12. Discuss the basic principle of superscalar architecture.

(12x1=12 weightage)

Part B
Answer any six questions.
Each question carry two weightages

13. Simplify the following function using K-MAP avoiding redundancy:
$$F(A,B,C,D) = \Sigma(0,2,3,5,7,8,9,10,11,13,15)$$
14. With the help of circuit diagram explain the design of a full adder circuit. Discuss how it is used for making 4 bit parallel adder.
15. Explain the three different methods of avoiding multiple interrupts.
16. Explain execution of a complete instruction Add (R3),R1 with control sequence in single bus architecture.
17. Explain the different hazards in a pipeline architecture and methods used to avoid them.
18. Explain with the help of diagrams, how memory interleaving enhances the performance.
19. Discuss the role of string instructions in 8086 processors and how they are working.
20. What are the different types of interrupts in 8085 processor and briefly discuss them.
21. Discuss how a 8051 microcontroller is diffrent from a general purpose microprocessor.

(6 x2=12 Weightage)

Part C
Answer any three questions.
Each question carries 4 wightages

22. Explain the design of an 4 bit parallel adder cuircuit with carry look ahead logic.
23. With the help of diagram explain the working of a processor in a three bus architectu
24. Explain the Booth algorithm for multiplication with a suitable example.
25. Discuss the three different Mapping functions in the Cache memory using the diagra
26. Explain the 8086 architecture with the help of the internal block diagram.
27. Explain theSDRAM circuit with the help of internal diagram. How performance is ir in DDR and RDRAM?

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