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Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Computer Science Degree Examination, November 2024

MCS1C01 – Discrete Mathematical Structures

(2022 Admission onwards)

Time: 3 hours   Max. weightage : 30

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

1. Explain different connectives using in propositional logic.

2. Discuss on free and bound variables.

3. Illustrate pigeon hole principle.

4. Define Lattice and Lattice Homomorphism.

5. Discuss on Permutation groups.

6. Define Eulerian Circuits and Hamiltonian Circuits.

7. Define a) Integral domain b) complete bipartite group.

(4x2 = 8 weightage)

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

8. Show that $\neg(P \wedge Q) \rightarrow (\neg P \vee (\neg P \vee Q)) \Leftrightarrow (\neg P \vee Q)$

9. Explain different type of functions with examples.

10. Let $x = \{1,2,3,4,5,6,7\}$ and the relation $R=\{(x, y) \mid x\text{-}y \text{ is divisible by } 3\}$.
    Check whether R is an equivalence relation. Draw the graph of R.

11. a) Explain rings and fields   b)Define Power Set
    c) Write the Euler formula for planar graph

12. Show that every chain is a distributive lattice.

13. Discuss Dijikstra's algorithm.

14. Discuss Lagrange's theorem.

(4 x 3 = 12 weightage)

PART C

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

15. Derive the disconjuctive normal form of P → ((P →Q) ∧ ⌐(⌐Q ∨⌐P))

16. What is partial ordering relation? Let A be a given finite set and P(A) its power set. Let ⊆ be the inclusion relation on the elements of P(A) . Draw Hasse diagram of ⟨P (A), ⊆⟩ for

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

17. What is minimum spanning tree? Explain Prim's algorithm with example.

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

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(2 x 5= 10 weightage)

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Computer Science Degree Examination, November 2024

MCS1C02 – Advanced Data Structures

(2022 Admission onwards)

Time: 3 hours

Max. weightage : 30

SECTION A

Answer *four* questions. Each question carries *two* weightage.

1. What is the trade off between time & space complexity?.

2. Write notes on Linear data structures.

3. Explain queue data structure.

4. What is a skip list?. Explain.

5. Define m-way search tree.

6. What is BST? Explain.

7. What is meant by skew heap? Explain.

(4 x 2 = 8 Weightage)

SECTION B

Answer *any four* questions. Each question carries *three* weightage.

8. What is meant by the '*address formula*'? Explain.

9. What is a *Sparse* matrix? Explain.

10. Explain the concept of *threaded* binary tree.

11. What is meant by *hashing*? Explain its relevance.

12. What are heap trees? Explain different types of heap trees.

13. What is *RED-BLACK* Tree? Give properties.

14. Write a note on B-Trees.

(4 x 3 = 12 Weightage)

SECTION C

Answer *any two* questions. Each question carries *five* weightage.

15. Explain any four sorting algorithms and compare their time complexities.

16. What are Graphs? Explain their representation methods.

17. Explain Stack and queue with examples. Give algorithms for their operations.

18. Explain various hashing techniques.

(2 x 5 = 10 Weightage)

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Computer Science Degree Examination, November 2024

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 Alphabets, Strings and Languages.

2. What is the use of NFA with epsilon moves?

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

4. Briefly explain regular languages.

5. What is the use of Chomsky Normal Form?

6. Give DFA for the language L = {all strings with not more than two 'b' s; Σ = {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. State equivalence of CFG and PDA (no proof is needed).

9. Define Normal forms CNF and GNF with one example each.

10. Explain the pumping lemma for context free sets.

11. Distinguish between P an NP class of problems.

12. Convert the grammar in to CNF.

     S —>aS | aB | ab

     B -->cBd | cd

13. Construct a PDA for the language $L = \{ a^n cb^n \mid n \geq 1\}$.

14. Explain Linear Bounded Automata.

(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 aab*(a+b)*.

16. Construct DFA equivalent to the given NFA

    $M = (\{q0, q1\}, \{a,b\}, \delta, q0, (\{q1\}))$

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

    $\delta(q1, a) = \Phi$; $\delta(q1, b) = \{q1\}$;

17. Explain Turing machine. Design a TM to accept the language $L = \{ a^n b^n c^n | n \geq 1 \}$.

18. Explain NP Completeness.

(2 x 5 = 10 weightage)

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Computer Science Degree Examination, November 2024

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. Define structured programming and explain its advantages.

2. Draw a flowchart to find the area of a circle given its radius.

3. Write a C program to swap two numbers using a third variable.

4. Explain the difference between interpreters and compilers with examples.

5. Write a note on the use of header files in C programming.

6. Explain the steps involved in compiling and running a C program.

7. What are the different types of programming errors? Provide examples for each.

(4 x 2 = 8 weightage)

Part B
Answer any 4 questions. Each question carries 3 weightage.

8. Describe function prototype and explain its significance in C programming.

9. Compare entry-controlled and exit-controlled loops with suitable examples.

10. Write a C program to input a list of numbers and find the sum of even numbers.

11. Discuss the various type modifiers in C such as signed, unsigned, long, and short.

12. Write and explain any five string manipulation functions in C.

13. Differentiate between if-else ladder and switch-case statements with examples.

14. Explain operator precedence and associativity with an example in C.

(4 x 3 = 12 weightage)

Part C
Answer any 2 questions. Each question carries 5 weightage.

15. Explain recursive functions with an example and discuss its advantages and disadvantages.

16. Describe the general structure of a C program and provide an example program to calculate the factorial of a number.

17. Write a C program to demonstrate the working of a for loop to generate the multiplication table of a number.

18. Design a flowchart to convert a given decimal number to binary and write the corresponding C program.

(2 x 5 = 10 weightage)

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester M.Sc Computer Science Degree Examination, November 2024

MCS1C05 – Computer Organization and Architecture

(2022 Admission onwards)

Time: 3 hours   Max. weightage : 30

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

1. Draw and explain JK flip flop.

2. Briefly explain the different segment registers in 8086.

3. Explain the different stages of the instruction cycle.

4. What is the fundamental concept register transfers?

5. Explain 3 bit multiplexer.

6. What is direct memory access?

7. What is interrupt nesting?

                                                     (4x2 = 8 weightage)

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

8. What is a shift register? Explain various types.

9. What are the different types of control units?

10. Explain signed number multiplication.

11. Describe memory hierarchy.

12. What is Daisy chaining?

13. Draw functional block diagram of 8085.

14. Explain I/O interfaces and I/O channels.

                                                     (4 x 3 = 12 weightage)

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

15. Describe working of a asynchronous counter.

16. Illustrate floating point numbers and operations.

17. What is mapping? Explain various types.

18. Explain architecture of 8086 instruction set.

                                                     (2x5=10weightage)