

St. Thomas' College of Engineering & TechnologyB. Tech. 4th Semester, 1st Internal Examination, March 2022

Discrete Mathematics(PCC-CS401)

Full Marks : 50**Time : 1 1/2 Hour.**

1st

Group-A

1. Choose the correct alternatives

1×5

- i) Let A be set of all prime numbers, B be the set of all even prime numbers, C be the set of all odd prime numbers, then which of the following is true?
- a) $A \equiv B \cup C$ b) B is a singleton set
 c) $A \equiv C \cup \{2\}$ d) All of the mentioned
- ii) Let R be a non-empty relation on a collection of sets defined by ARB if and only if $A \cap B = \emptyset$ Then (pick the TRUE statement)
- a) R is symmetric and not transitive b) R is an equivalence relation
 c) R is reflexive and transitive d) R is not reflexive and not symmetric
- iii) "x/y" means that x is a factor of y, then the relation T is
- a) reflexive, transitive and not symmetric b) reflexive, transitive and symmetric
 c) transitive and symmetric d) reflexive and symmetric
- iv) If A and B are sets and $A \cup B = A \cap B$, then
- a) $A = B$ b) $A = \Phi$ c) $B = \Phi$ d) none of these
- v) Let S be an infinite set and $S_1, S_2, S_3, \dots, S_n$ be sets such that $S_1 \cup S_2 \cup S_3 \cup \dots \cup S_n = S$ then
- a) at least one of the sets S_i is an infinite set b) at least one of the sets S_i is a finite set
 c) not more than one of the set S_i can be infinite d) none of these

Group-B

Answer the following questions:

2. Let, the relation ρ is defined on the set Z by " $a \rho b$ iff $(a-b)$ divisible by 17 " for $a, b \in Z$. Examine ρ is equivalence or not. 5
3. Let, S be the set of all +ve divisors of 72. Check (S, \leq) is a poset or not, where $a \leq b$ means "a is a divisor of B" for $a, b \in S$. 5
4. Explain bijective mapping with suitable example. 5

Group-C

Answer the following questions:

5. a) When an element in a groupoid (G, o) is said to be left invertible or right invertible? Give an example.
- b) In the groupoid $(Z, *)$ where * is defined by $a * b = a + 2b$, $a, b \in Z$, 0(zero) is a right identity. Check the following and justify your answer
- i) -3 in Z is left 0-invertible or not
 ii) -3 in Z is right 0-invertible or not
 iii) -4 in Z is left 0-invertible or not
 iv) -4 in Z is right 0-invertible or not 3+(3×4)
6. a) Proof that if a groupoid (G, o) contains a left identity as well as a right identity then they are equal & the equal element is the identity element in the groupoid.
- b) Proof that in a monoid (G, o) if an element a be invertible then it has a unique inverse. 8+7

	Q1	Q2	Q3	Q4	Q5	Q6
CO	PCC-CS401.1	PCC-CS401.1	PCC-CS401.1	PCC-CS401.1	PCC-CS401.1	PCC-CS401.1
BL	1	3	5	2	5	3

22/03/22

4/CS & IT/141

3rd

St. Thomas' College of Engineering & Technology

B. Tech. 4th Semester, 1st Internal Examination, March 2022
Environmental Science [MC - 401]

Full Marks : 50**GROUP-A****Time : 1½ Hour**

(Multiple Choice Type Questions)

Q1. Choose the correct alternatives for the following:

i) The Venus albedo is

 $5 \times 1 = 5$

- a) 0.15
- b) 0.30
- c) 0.75
- d) 0.10

ii) The atmospheric window is

- a) 8 to 18 μm
- b) 7 to 9 μm
- c) 7 to 12 μm
- d) 13 to 18 μm

iii) The emissive power of black body radiation per unit area is

- a) directly proportional to the 4th power of temperature in kelvin
- b) directly proportional to the 4th power of absolute surface temperature
- c) directly proportional to the 4th power of absolute temperature of the body
- d) directly proportional to the 4th power of surface temperature

iv) The stable atmosphere is found in

- a) mesosphere
- b) troposphere
- c) stratosphere
- d) none of the above

v) The highest GWP of the following is

- a) CO₂
- b) CH₄
- c) H₂O vapour
- d) CFCs

GROUP-B

(Short Answer Type Questions)

 $3 \times 5 = 15$

Q2. State Stefan-Boltzmann law of black body radiation. What is Wien's displacement rule?

Q3. What are the segments of our environment? Describe hydrologic cycle and mention important sources of hydrosphere.

Q4. Based on earth albedo derive Global surface temperature model

GROUP-C

(Long Answer Type Questions)

 2×15

Q5. a) What is brackish water & its TDS level ? What are important nutrient water pollutants? 5

b) What is BOD & COD ? Out of these which one is the most important water parameter? 5

c) Describe the structure of atmosphere based on temperature profile. 5

Q6. a) Why the actual earth surface temperature is more than effective global surface temperature ? 4

b) What is advanced Green house effect ? Name the most important six green house gases. 5

c) What are the consequences of advanced GHE ? What is the basis of GWP gas ? 6

OUTCOME BASED EDUCATION (OBE)						
CO mapping With Bloom's Level						
Q. No.	Q1(i - v)	Q2	Q3	Q4	Q5	Q6
Course Outcome	CO1	CO1	CO2	CO1	CO3	CO1
Bloom's Level (in fig.)	2	3	2	5	4	4

Bloom's Level: Remember = 1, Understand = 2, Apply = 3 Analyse = 4 Evaluate = 5, Create = 6

Full Marks : 50

Biology [BSC – 401]

Time : 1 ½ Hour

GROUP A (MCQ QUESTIONS) (5x1=5)

1. Which of the following amino acid is non essential?

 - Lysine
 - Leucine
 - Valine
 - Serine

2. Which Amino acid is optically inactive?

 - Aspartate
 - Lysine
 - Glutamine
 - Glycine

3. What bond connects two nucleotides?

 - Glycosidic bond
 - Peptide bond
 - Amide bond
 - Phosphodiester bond

4. Name a non proteinaceous enzyme.

 - 23 s rRNA
 - Glucose
 - Proline
 - Glucokinase

5. Enzymes prefer the attainment of products by favouring the forward reaction equilibrium.

a. True b. False c. Can not comment d. None

GROUP B (SHORT ANSWER TYPE QUESTIONS) (3x5=15)

6. How do you classify organisms based on carbon and electron requirements? Define a photolithoautotroph (2+2+1) Pg 18, 19

7. What information do you get from the primary structure of a protein? What are the two secondary structures that a protein can form. What is the difference between proteins having tertiary structure and quaternary structure? (1+2+2) Pg 82

8. Give an example of a food substance from your kitchen which is nearly fully proteinaceous. What is denaturation of proteins? Name two functions proteins perform in a biological system. (1+2+2)

Pg 87

GROUP C (LONG ANSWER TYPE QUESTIONS) (2X15=30)

9. A. How many kingdoms did Whittaker classify the living organisms into? Name them. Compare these kingdoms based on any 4 characteristics. (1+2+8) Glassroom

B. How does the K_m and V_{max} of an enzyme catalysed reaction change in presence of a competitive inhibitor? Explain with the help of a graph. (4) Pg 119

10. A. How do you classify organisms based on the mode of nitrogenous waste material they excrete out? Compare the groups with examples. (2+6) Pg 20, 21

B. What are the two models by which an enzyme can hold a substrate for catalysis? (4) Pg 113
C. Explain the fluid mosaic model of cell membrane (3)

OUTCOME BASED EDUCATION (OBE)		
CO mapping with Bloom's Level		
Q NO.	CO	BLOOMS LEVEL
1	3	1
2	3	3
3	3	1
4	3	1
5	3	4
6	3	2
7	2	2
8	2	2
9-A	2	1
9-B	3	4
10-A	2	1
10-B	3	2
10-C	2	1

Bloom's Level: Remember = 1, Understand = 2,
Apply = 3, Analyse = 4, Evaluate = 5, Create = 6

St. Thomas' College of Engineering & Technology

B. Tech. 4th Semester, 1st Internal Examination, March 2022
Design and Analysis of Algorithm(PCC CS-404)

Full Marks : 50

Time : 1 1/2 Hour.

Group A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the followings:

$1 \times 5 = 5$

- (i) Lower bound for any comparison sort is
 - (a) $O(n \log n)$
 - (b) $\Omega(n \log n)$
 - (c) $O(n \log n)$
 - (d) $\Theta(n \log n)$.

- (ii) Complexity of Binary search is
 - (a) $O(n)$
 - (b) $O(n \log n)$
 - (c) $O(\log n)$
 - (d) $O(n^2)$.

- (iii) Minimum spanning tree is obtained by
 - (a) BFS
 - (b) DFS
 - (c) Prim's algorithm
 - (d) Bellman-Ford.

- (iv) Fractional Knapsack problem is solved by
 - (a) Dynamic Programming
 - (b) Greedy method
 - (c) Backtracking
 - (d) Divide-and-conquer method.

- (v) Which of the following statement is true?
 - (a) $O(n \log_2 n) = O(n \log_e n) = O(n \log_{10} n)$
 - (b) $O(n \log_2 n) \neq O(n \log_e n) \neq O(n \log_{10} n)$
 - (c) $O(n \log_2 n) \geq O(n \log_e n) \geq O(n \log_{10} n)$
 - (d) $O(n \log_2 n) \leq O(n \log_e n) \leq O(n \log_{10} n)$.

Group B

(Short answer type)

2. Prove that the average case time complexity of the Quick Sort algorithm is $O(n \log n)$. [5]

3. Time complexity of selection sort algorithm is at least $O(n^2)$ is meaningless -Justify your answer. [5]

4. Develop the algorithm for finding the maximum and minimum element using divide and conquer method.
[5]

Group C

(Long answer type)

5. Discuss about different types of asymptotic notation. Show that $\log n! \in \Theta(n \log n)$. [10+5]

6. What is the solution generated by the problem job sequencing with deadline when $n=7$,

$(d_1, d_2, d_3, d_4, d_5, d_6, d_7) = (2, 2, 1, 1, 3, 3, 4)$, and $(p_1, p_2, p_3, p_4, p_5, p_6, p_7) = (13, 16, 11, 40, 15, 28, 30)$?

Calculate the optimal solution using Greedy criteria for a knapsack having capacity 45 kg for the following fractional knapsack problem $(p_1, p_2, p_3, p_4, p_5) = (20, 10, 15, 30, 70)$ and $(w_1, w_2, w_3, w_4, w_5) = (10, 3, 10, 20, 20)$.
[6+(3+3+3)]

OUTCOME BASED EDUCATION (OBE)						
CO mapping With Bloom's Level						
Question No.	Q1	Q2	Q3	Q4	Q5	Q6
Course Outcome	CO1	CO6	CO6	CO4	CO2	CO3
Bloom's Level	1	4	5	5	3	4

Bloom's Level: Remember = 1, Understand = 2, Apply = 3 Analyze = 4 Evaluate = 5, Create = 6

St. Thomas' College of Engineering & Technology

B. Tech. 8th Semester, 1st Internal Examination, March 2020
Formal Language and Automata Theory (PCC CS – 403)

8/CS/72

23/03/22

15

Full Marks : 50

GROUP-A

Time : 1 1/2 Hour.

1. Multiple Choice Questions.

- i) Regular expression for all strings starts with ab and ends with bba is. [1 × 5 = 5]
 - a) aba^*b^*bba
 - b) $ab(ab)^*bba$
 - c) $ab(a+b)^*bba$
 - d) All of the mentioned

- ii) Predict the number of transitions required to automate the following language using only 3 states:
 $L = \{w \mid w \text{ ends with } 00\}$
 - a) 3
 - b) 2
 - c) 4
 - d) Cannot be said

- iii) Which of the following statements is not true?
 - a) Every language defined by any of the automata is also defined by a regular expression
 - b) Every language defined by a regular expression can be represented using a DFA
 - c) Every language defined by a regular expression can be represented using NFA with ϵ moves
 - d) Regular expression is just another representation for any automata definition

- iv) Which of the following options is correct?
 - a) NFA is slower to process and its representation uses more memory than DFA
 - b) DFA is faster to process and its representation uses less memory than NFA
 - c) NFA is slower to process and its representation uses less memory than DFA
 - d) DFA is slower to process and its representation uses less memory than NFA

- v) $(0+\epsilon)(1+\epsilon)$ represents
 - a) $\{0, 1, 01, \epsilon\}$
 - b) $\{0, 1, \epsilon\}$
 - c) $\{0, 1, 01, 11, 00, 10, \epsilon\}$
 - d) $\{0, 1\}$

GROUP-B

Short Answer Type Questions.

2. Differentiate DFA and NFA.
3. Write a regular expression which does not contain the substring ba. Also, draw the DFA.
4. Define regular expression.

[5 × 3 = 15]

[5]

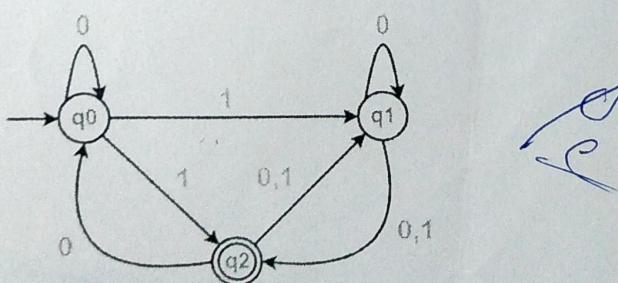
[5]

GROUP-C

Long Answer Type Questions.

5. a) Convert the following Non-Deterministic Finite Automata (NFA) to Deterministic Finite Automata (DFA) by subset construction.

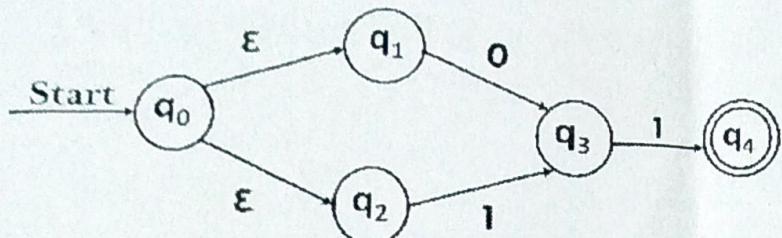
[15 × 2 = 30]



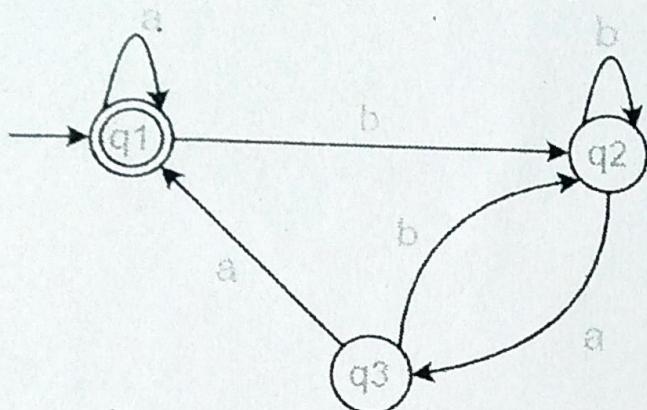
- b) Construct an ϵ NFA for the language $L = (a+b)^*b(a+bb)^*$ using Thompson's construction.

[8+7=15]

- 6 a) Convert the following NFA into DFA by epsilon closure.



b) Find regular expression for the following DFA using Arden's Theorem.



[10+5=15]

OUTCOME BASED EDUCATION (OBE)								
CO mapping With Bloom's Level								
Question No.	Q1	Q2	Q3	Q4	Q5a	Q5b	Q6a	Q6b
Course Outcome	CO.1	CO.2						
Bloom's Level (in fig)	1	4	5	2	6	6	6	6

Bloom's Level: Remember = 1, Understand = 2, Apply = 3 Analyze = 4 Evaluate = 5, Create = 6

St. Thomas' College of Engineering & Technology

B. Tech. 4th Semester, 1st Internal Examination, March 2022
Computer Architecture [PCC – CS – 402]

Full Marks : 50

Time : 1 1/2 Hour.

Group A

1. Multiple choice type questions 5 X 1
- i) Dynamic pipeline allows
 - a) multiple functions to evaluate b) only streamline connection c) perform fixed function d) all of these
 - ii) The number of cycles required to complete n tasks in k stage pipeline is
 - a) $k+n-1$ b) $nk+1$ c) k
 - d) constant
 - iii) The prefetching technique is a solution for
 - a) Data Hazard b) Structural Hazard c) Control Hazard d) Enhance the speed of pipeline
 - iv) Which of the following has no practical usage?
 - a) SISD b) SIMD c) MISD d) MIMD
 - v) Pipelining uses
 - a) data parallelism b) temporal parallelism c) spatial parallelism d) Control parallelism

Group B

3 X 5

2. What is branch hazard? Briefly discuss two methods to handle branch hazards.
3. What is the drawback of direct mapped cache? How is it resolve in set associative?
4. Explain in brief with neat diagrams the Flynn's classification of pipeline computer.

Group C

2 X 15

5. What is cache memory? Define global and local miss with suitable example. 5+5+5
 Describe different technique to reduce cache miss penalty.
 Describe different technique to reduce cache miss rate.
6. What is the difference between Computer Organization and Computer 5+5+5
 Architecture? What are the different types of data hazard? Explain them.
 What are the different approaches taken by pipeline processor to handle data hazard?
 Briefly illustrated the approaches.

OUTCOME BASED EDUCATION (OBE)						
CO mapping With Bloom's Level						
Question No.	Q1	Q2	Q3	Q4	Q5	Q6
Course Outcome	1	2	4	3	4	5
Bloom's Level (in fig)	1	2	4	2	5	5

Bloom's Level: Remember = 1, Understand = 2, Apply = 3 Analyze = 4 Evaluate = 5, Create = 6