St. Thomas' College of Engineering & Technology

B. Tech. 4th Semester, 2nd Internal Examination, May 2022

Formal Languages and Automata Theory [PCC CS 403]

Full Marks : 25 **Time : 1 Hr.**

GROUP- A

1. Multiple Choice Questions. [1 × 5 =5]

i) The context sensitive language is not closed under _____ operation
a) union
b) complement
c) intersection
d) homomorphism

ii) Which of the following Machine is specific for Context sensitive grammar?
a) Finite Automata
b) Pushdown Automata
c) Linear Bounded Automata
d) Turing Machine

iii) Production Rule:
aYb->agb
belongs to which of the following languages?
a) Recursively Enumerable Language
b) Context free Language
c) Context Sensitive Language
d) Regular Language

iv) Every context sensitive language is _____.
a) recursive
b) recursively enumerable
c) both of a & b
d) none of the above

v) The language $L=\{a^n \mid n \text{ is prime}\}$ is accepted by
a) Finite Automata
b) Pushdown Automata
c) Linear Bounded Automata
d) None of the above

GROUP- B

Short Answer Type Questions. [5 × 4 = 20]

2. Check using pumping lemma whether the following language is context free or not. [5]
$L=\{0^m 1^m 2^m \mid m \text{ is a Natural Number}\}$ and $\Sigma = \{0, 1, 2\}$.
3. Explain linear bounded automata in detail with a diagram. [5]
4. Prove that context free languages are closed under union. [5]
5. Consider the grammar G whose productions are:
S -> 1A0S
S -> 1A0S1S
A -> 1
S -> 0
Prove that the above given grammar is ambiguous. [5]

OUTCOME BASED EDUCATION (OBE)					
CO mapping With Bloom's Level					
Question No.	Q1	Q2	Q3	Q4	Q5
Course Outcome	CO.4	CO.3	CO.4	CO.3	CO.2
Bloom's Level (in fig)	1	3	2	4	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, 2nd Internal Examination, May 2022

Environmental Sciences [MC - 401]

Full Marks : 25 **Time : 1 Hour**

GROUP A
(Multiple Choice Questions)

1. Choose the correct alternative from the following: 1 x 5

   a) The food chain that starts from dead organic matter is
   i) predator ii) detritus iii) parasitic iv) none of these

   b) In ecosystem fungi are
   i) photoautotrophs ii) primary consumer iii) secondary consumer iv) decomposer

   c) *Azotobacter* are
   i) N_2 fixing bacteria ii) ammonifying bacteria iii) nitrifying bacteria iv) denitrifying bacteria

   d) The only liquid layer found in the earth's interior is
   i) outer mantel ii) inner mantel iii) outer core iv) inner core

   e) Which of the following is not a characteristic of radioactive waste?
   i) Reactivity ii) Ignitability iii) Bio-degradability iv) Toxicity

GROUP B
(Short Answer Type Questions)

2. What do you mean by symbiosis? Explain the interrelationship with the help of an example. 2+3
3. Write three differences between igneous and sedimentary rock. How are metamorphic rocks formed? Give an example of metamorphic rock mentioning its parent rock. 3+1+1
4. What do you mean by genetic diversity? Discuss any three threats to bio-diversity. 2+3
5. What do mean by composting? What are its advantages? 2+3

Outcome Based Education (OBE)						
CO mapping with Bloom's Level						
Q. No.	1 (a-c)	1(d, e)	2	3	4	5
Course Outcome	4	5	4	5	4	5
Bloom's Level (in fig.)	2	2	3	2	3	3

St. Thomas' College of Engineering & Technology

B. Tech. 4th Semester, 2nd Internal Examination, May 2022

Discrete Mathematics (PCC-CS401)

Full Marks : 25 **Time : 60 Mins.**

Group-A

1×5

1. *Choose the correct alternatives*

i) A compound proposition that is neither a tautology nor a contradiction is called a

a) Contingency b) Equivalence c) Condition d) Inference

ii) Power set of empty or Null set has exactly _____ subset.

a) One b) Two c) Zero d) Three

iii) Minimal remainder of 416 with respect to 42 is

a) 0 b) 4 c) -4 d) none of these

iv) Precedence of logical connectives from higher to lower precedence is

a) →,^, v,~, ↔ b) ^, v,~, →, ↔ c) ~,^, v,→, ↔ d) none of these

v) Which among the following can be taken as the discrete object?

a) People b) Rational numbers c) Integers d) all of these

Group-B

4×5

Answer the following questions:

2. Explain minimal remainder with suitable examples.
3. Prove that the product of any three consecutive integers is divisible by 3!.
4. Show that cube of any integers is of the form 9p, 9p+1, 9p+8 (or of the form 9p or 9p±1).
5. Describe the procedure to obtain DNF of a given logical expression.
6. Proof that in a group(G,o)
   - i) $a \circ b = a \circ c$ implies $b = c$
   - ii) $b \circ a = c \circ a$ implies $b = c$

Outcome Based Education(OBE)						
CO mapping with Bloom's Level						
	Q1	Q2	Q3	Q4	Q5	Q6
CO	PCC-CS401.3	PCC-CS401.4	PCC-CS401.4	PCC-CS401.6	PCC-CS401.2	PCC-CS401.1
BL	1	2	3	5	3	3

1. Evaluate = 5, Create = 6

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B. Tech. 4th Semester, 2nd Internal Examination, May 2022

Computer Architecture [PCC – CS 402]

Full Marks : 25 **Time : 60 Mins.**

1. i) Which of the following is the full form of CISC? 5x1

a) Complex Instruction Sequential Compilation
b) Complete Instruction Sequential Compilation
c) Computer Integrated Sequential Compiler
d) Complex Instruction Set Computer

ii) In order to read multiple bytes of a row at the same time, we make use of _____

a) Memory extension
b) Cache
c) Shift register
d) Latch

iii) Any condition that causes a processor to stall is called as _____

a) Hazard
b) Page fault
c) System error
d) None of the mentioned

iv) _____ have been developed specifically for pipelined systems.

a) Utility software
b) Speed up utilities
c) Optimizing compilers
d) None of the mentioned

v) The fetch and execution cycles are interleaved with the help of _____

a) Modification in processor architecture
b) Clock
c) Special unit
d) Control unit

2. How do you calculate the optimal performance/cost ratio (PCR) for a pipelined architecture ? How to achieve the maximum throughput of a pipelined architecture? 5

3. Describe the shared memory model of SIMD architecture. 5

4. What is locality of reference? What is biased exponent? 2 + 3

5. Draw data flow graph to represent the following computations : 5

1. A = P + Q
2. B = A / Q
3. C = P * A
4. D = C – B
5. E = C * A
6. F = D / E

OUTCOME BASED EDUCATION (OBE)					
CO mapping With Bloom's Level					
Question No.	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
Course Outcome	**1**	**2**	**6**	**3**	**5**
Bloom's Level (in fig)	**1**	**3**	**4**	**6**	**5**

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

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B. Tech. 4th Semester, 2nd Internal Examination, May 2022

Design and Analysis of Algorithm(PCC CS-404)

Full Marks: 25 **Time: 1 hour.**

Group A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for the followings: [1×5=5]

(i) The appropriate running time of Kruskal's algorithm is
a) O(Elog E) b) O(E log V) c) O(V log E) d) O(V log V)

(ii) Which of the following is/are property/properties of a dynamic programming problem?
a) Optimal substructure b) Overlapping subproblems c) Greedy approach
d) Both optimal substructure and overlapping subproblems

(iii) Bellman Ford Algorithm is an example for _____
a) Dynamic Programming b) Greedy Algorithms c) Linear Programming d) Branch and Bound

(iv) _____ is an asymptotically tight bound.
a) Big-O b) Ω c) θ d) None of the above

(v) The minimum number of colors needed to color a graph having n (>3) vertices and 2 edges is
a) 1 b) 2 c) 3 d) 4

Group B
(Short Answer Type Questions)

[4×5=20]

2. Discuss the relationship between class P, NP, NP complete and NP hard problems with suitable diagram. [5]

3. What are the two types of constraints used in backtracking? Give the explicit and implicit constraints for 8-queen problem. [5]

4. Solve the all-pairs shortest path problem for the diagraph with the weight matrix given below: [5]

	V1	V2	V3
V1	0	5	12
V2	7	0	3
V3	4	∞	0

5. Solve the following recurrences using Master's theorem. [2.5+2.5]

i) $T(n) = 3T\left(\frac{n}{4}\right) + n\,logn$ ii) $T(n) = 4T\left(\frac{n}{2}\right) + 1$

OUTCOME BASED EDUCATION (OBE)					
CO mapping With Bloom's Level					
Question No.	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
Course Outcome	**CO1**	**CO6**	**CO5**	**CO4**	**CO3**
Bloom's Level	**1**	**3**	**3**	**4**	**4**

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

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B. Tech. 4th Semester, 2nd Internal Examination, May 2022

Biology (BSC-401)

Full Marks : 25 **Time : 1 Hour.**

GROUP A: MULTIPLE CHOICE BASED QUESTIONS: (5*1=5)

1. Which enzyme catalysed reaction is called the pacemaker step of glycolysis?
   - A. Phosphofructokinase
   - B. Aldolase
   - C. Pyruvate kinase
   - D. succinate dehydrogenase

2. Which of the following is the energy currency of a cell?
   - A. ATP
   - B. NADH
   - C. NADPH
   - D. $FADH_2$

3. PS1 absorbs maximally at
   - A. 700 nm
   - B. 480nm
   - C. 680nm
   - D. 548nm

4. The first stable compound of TCA cycle is
   - A. Citric acid
   - B. Oxaloacetic acid
   - C.α- Ketoglutaric acid
   - D. Phosphoenol pyruvate

5. Which enzyme catalyses the phosphorylation of glucose?
   - A. Glucokinase
   - B. Hexokinase
   - C. Both A and B
   - D. None.

GROUP B: DESCRIPTIVE QUESTIONS: (5*4=20)

6. What are the different stages of bacterial growth? Explain with a graph. What is the importance of the lag phase? Which phase would you likely not observe during turbidometric analysis? Why?

7. Differentiate between cyclic and non cyclic photophosphorylation , using the help of the z scheme of photosynthesis.

8. With the help of a dihybrid cross, explain the phenotypic ratio observed by Mendel in F2 generation. How does this ratio change in case of dominant and recessive epistasis?

9. Explain the krebs cycle, mentioning the number of high energy molecules formed during the cycle.

Q. NO	1-5	6	7	8	9
COURSE OUTCOME	CO-5	CO-6	CO-5	CO-3	CO-5
BLOOMS LEVEL	3	1	4	4	4