PSG COLLEGE OF TECHNOLOGY, COIMBATORE - 641 004

Department of Computer Science and Engineering

BE CSE – G1 & G2

CONTINUOUS ASSESSMENT TEST 3

19Z501 - Theory of Computing

Date: 22.10.2024

Time: 1 Hour 15 minutes. **Maximum Marks: 35**

INSTRUCTIONS:

1. Answer **ALL**questions.
2. Question No. **1**carries 8 marks and question No. **2**carries 27 marks
3. In question No. **1**, subdivision **a** carries total of 8 marks (one mark for each question).
4. In question No. 2, subdivision **a** carries total of 7 marks (one mark for each question), subdivisions**b(i)**and **b(ii)**carries 5 marks each and subdivision **c** carries 10 marks.
5. Course Outcome Table :

Qn. 1	CO 1 to 4

Qn.2	CO5

1. a **(8 x 1 mark = 8 marks)**

i. Which of the following regular expressions represents strings that start with '1', do not have consecutive '0's, and contain at least one '1'?

A. 1(1|0)*

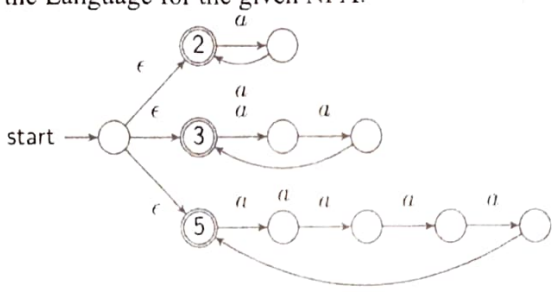
B. 1(10)*1*

C. 1(0|1)*(00)?

D. 1(1|10)*

[CO1 – Remember]

ii. Write the Language for the given NFA.



[CO1 – Understand]

iii. Consider the production rules of grammar G

S->Ab|Bb

A->aA|ϵ

B-> bB|ϵ

Which of the following Language L is generated by grammar G?

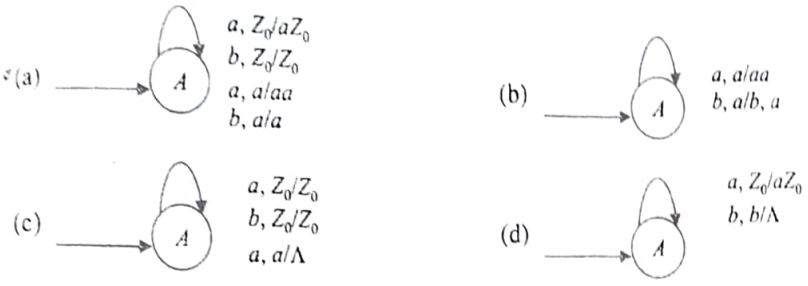
a) $L2=\{a^n b^m | n,m \geq 0\}$

b) $L2=\{a^n a | n \geq 0\} \cup \{b^n b | n \geq 0\}$

c) $L2=\{a^n b^n | n \geq 0\}$

d) $L2=\{a^n a^m | n,m \geq 0\}$

[CO2 – Understand]

iv.	Consider the following grammar: S→AB|BA A→aA|a B→bB|b Is the grammar ambiguous? **[CO2 – Remember]**	
v.	The PDA move that pushes a's into stack and ignore b's is _____  **[CO3 – Apply]**	
vi.	The Language which is generated by the grammar S→aSa|bSb|a|b over the alphabet {a,b} is the set of _____ **[CO3 – Understand]**	
vii.	Which of the following statement(s) on Turing machine variants is (are) false? I. Multi-Tape Multi-head Turing machine can be simulated by a standard Turing machine. II. Multi dimensional tape Turing machine cannot be simulated by one-dimensional Turing machine III. A non-deterministic Turing machine is equivalent to the deterministic Turing machine. A. Only II B. I, II and III C. II and III D. I and III **[CO4 – Remember]**	
viii.	A language is defined to be recursively enumerable if there exists a Turing machine that _____ **[CO4– Remember]**	
2.a.		**(7 x 1 mark = 7 marks)**
i)	Given the set of dominos, is it possible to list these dominos (repetitions permitted) so that the string of symbols on top is the same as the string of symbols on the bottom? Write the solution. $(D_1, D_2, D_3, D_4) = \left(\boxed{\begin{matrix} b \\ ca \end{matrix}}, \boxed{\begin{matrix} a \\ ab \end{matrix}}, \boxed{\begin{matrix} ca \\ a \end{matrix}}, \boxed{\begin{matrix} abc \\ c \end{matrix}} \right)$ **[CO5 – apply]**	

ii)	Let S be an NP-complete problem, Q and R be two other problems not known to be in NP. Q is polynomial time reducible to S and S is polynomial-time reducible to R. Which one of the following statements is true? A. R is NP complete B. R is NP hard C. Q is NP complete D. Q is NP hard **[CO5– Apply]**	
iii)	Which of the following statements correctly distinguishes tractable and intractable problems? A) Tractable problems belong to class P, while intractable problems belong to class NP-complete or NP-hard. B) Intractable problems are always unsolvable, whereas tractable problems are solvable within exponential time. C) Tractable problems are solvable by nondeterministic algorithms, while intractable problems require heuristic approaches. D) Tractable problems can only be solved using brute force, while intractable problems have polynomial-time solutions. **[CO5– Remember]**	
iv)	Which of the following is true regarding space complexity for recursive algorithms? A) The space complexity of a recursive algorithm is determined solely by the size of the input. B) Recursive algorithms always have linear space complexity due to the function call stack. C) Space complexity for a recursive algorithm includes the memory required for the call stack, in addition to the memory used by variables. D) The space complexity of any recursive algorithm is always greater than its time complexity. **[CO5– Remember]**	
v)	L and L' are both Recursively Enumerable , then L is _____ A. Recursively Enumerable B. Recursive C. Recursive and Recursively Enumerable D. None of above **[CO5– Remember]**	
vi)	The _____ denotes the class of decision problems that can be solved by deterministic algorithms in polynomial time. **[CO5– Remember]**	
vii)	A Function is considered primitive recursive if it can be obtained from initial functions and through finite number of _____and_____ **[CO5– Understand]**	
b.		**(2 x 5 marks = 10 marks)**
i)	Apply the concept of a Universal Turing Machine by illustrating its operation, including how it simulates the behavior of any Turing machine. **(Note : Consider Turing machine M that decides whether a given binary string contains an equal number of 0s and 1s)** **[CO5– Apply]**	

ii)	Distinguish between the characteristics of tractable and intractable problems by providing suitable examples for each. [CO5– Understand]	
c.		**(1 x 10 marks = 10 marks)**
i)	Apply the process of reducing the Boolean satisfiability problem (SAT) to the Clique problem. Given a Boolean formula F in conjunctive normal form (CNF) with m clauses, describe how to construct a graph G such that F is satisfiable if and only if G contains a clique of size k, where k=m. [CO5– Apply]	
	OR	
ii)	Apply the concept of Cook-Levin's theorem to explain its significance in computational complexity. In your explanation, illustrate how the theorem demonstrates that the Boolean satisfiability problem (SAT) is NP-complete and discuss its implications for other problems in NP. [CO5– Apply]	

CA Test 3
2019 Regulations

PSG COLLEGE OF TECHNOLOGY, COIMBATORE – 641 004

Department of Computer Science and Engineering

B.E CSE, SEMESTER V

CONTINUOUS ASSESSMENT TEST – Date: 22/10/2024

19Z502- Microprocessors and Interfacing

Time: 1 Hour 15 minutes. **Maximum Marks: 35**

INSTRUCTIONS:
1. Answer ALLquestions.
2. Question No. 1carries 8 Marks and question No. 2carries 27 Marks
3. In question No. 1, subdivision **a** carries total of 8 marks (one mark for each question)
4. In question No. 2, subdivision **a** carries total of 7 marks (one mark for each question), subdivisions **b(i)**and **b(ii)**carries 5 marks each and subdivision **c** carries 10 marks
5. Course Outcome Table :

Qn. 1	CO 1,2,3,4	Qn 2	CO5

(8 x 1 mark = 8 marks)

1. a

i) Compute the physical address for the Source operand of MOV AX, [BX] + 0400 The register contents are as follows: CS=0A00, DS=0B00, SI=0100, DI=0200, BX=0300

A) 0B200H B) 0B100H C) 0B700H D) 0B900H

ii) The instruction that will move the value 1234H into the CX register is ----------.

iii) Consider a word located at memory address 01231_{16} of an 8086 microprocessor How many bus cycles are required to read it from the memory?

A) 1 B) 2 C) 3 D) 4

iv) Connecting MN/MX to logic 0 selects the ---------- mode of operation

v) The ---------- is a peripheral designed to permit easy implementation of parallel I/O in the 8086 microprocessor based systems.

A) 82C05A B) 82C55A C) 82A55C D) 82A55A

vi) If ---------- is written to the control register, Mode 0 operation is selected for all three ports with the activation of D_7

vii) Which of the following interrupt requests is/are independent of IF flag?
i)NMI ii) TRAP iii) Divide by zero

A) i & ii B) i & iii C) ii & iii D) i, ii & iii

viii) What is the range of address reserved for storing the Interrupt vector table?

A) 00000H – 003EEH B) 00000H – 003EFH
C) 00000H – 003FEH D) 00000H – 003FFH

(7 x 1 mark = 7 marks)

2. a

i) How many threads can an Intel Core i7 processor with 8 physical cores handle, assuming Hyper Threading is enabled?

A) 16 threads B) 12 threads C) 8 threads D) 24 threads

ii) Which technology allows Intel Core i5 processors to dynamically increase their clock speed when needed?

A) Smart Cache B) Turbo boost
C) QuickPath Interconnect D) Hyper-Threading

iii) Which instruction set architecture is used in Raspberry Pi?

A) X86 B) AVR C) MSP D) ARM

iv) The Raspberry Pi4B has -------- USB2 and -------- USB3 type-A sockets.

A) 1 & 2 B) 2 & 3 C) 2 & 2 D) 2 & 1

v) The Arduino Uno - Atmega328 has -------- of flash memory for storing code of which -------- is used by boot loader

A) 16 KB and 0.5KB B) 32 KB and 0.5KB
C) 32 KB and 5KB D) 16 KB and 5KB

vi) In -------- cycle, the ARM7TDMI-S core requests a transfer to, or from an address which is unrelated to the address used in the preceding cycle.

vii) Intel Galileo development board is based on -------- processor.

(2 x 5 marks = 10 marks)

2. b

i) Compare the features of i3, i5 and i7 Intel Core Processors.
ii) Explain the features and advantages of Intel Galileo development System.

(1x 10 marks = 10 marks)

2. c

i) Discuss the architecture of Arduino Uno development board based on its features. Also show, how it is interfaced with external peripheral devices with few examples.

(OR)

ii) Illustrate the hardware architecture of ARM7TDMI-s processor and state its memory bus cycle types.

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PSG COLLEGE OF TECHNOLOGY, COIMBATORE - 641 004

Department of Computer science and engineering

CSE 5th Semester G2

CONTINUOUS ASSESSMENT TEST 3 Date: 23rd Oct 24

19Z503 - Artificial Intelligence

Time: 1 Hour 15 minutes. **Maximum Marks: 35**

INSTRUCTIONS:

1. Answer **ALL** questions.
2. Question No. 1 carries 8 Marks and question No. 2 carries 27 Marks
3. In question No. 1, subdivision **a** carries total of 8 marks (one mark for each question).
4. In question No. 2, subdivision **a** carries total of 7 marks (one mark for each question), subdivisions **b(i)** and **b(ii)** carries 5 marks each and subdivision **c** carries 10 marks.
5. Course Outcome Table : Q1: Unit1-3 Q2: Unit 4 and 5

Group I

1. a **(8 x 1 mark = 8 marks)**

- Write the alphabet of your choice answer for the questions i, iii, v & vii in the CA test answer book mentioning the question number and subdivision number.
- Write the answer for the Fill in the blanks questions ii, iv, vi & viii in the CA test answer book mentioning the question number and subdivision number.

i. Artificial Intelligence deals with (mark all that apply)

A)Partially known patterns **B)** Uncertainty **C)** Knowledge **D)** Totally unknown

ii. Heuristic search uses (mark all that apply)

A) Hill climbing B) Random jump **C)** DFS **D)** BFS

iii. Knowledge based systems use (mark all that apply)

A) Inference engine **B)** Knowledge base **C)** Probability D) Machine learning

iv. Backward chaining is useful because (mark all that apply)

A) reduces search **B)** ignores irrelevant hypotheses **C)** does not need probability **D)** does not need knowledge

v. Planning uses (mark all that apply)

A) Goal **B)** Partial order C) Fixed order **D)** Failure

vi. A* is an example of

A) DFS **B)** Iterative DFS **C)** Hill climbing **D)** Exhaustive search

vii. A Random jump is used to solve problems of

A)Many solutions **B)** Many goals **C)** Local Maxima **D)** Global Maxima

viii. Resolution in first order logic is the process of .....

2. a **(7 x 1 mark = 7 marks)**

Write the alphabet of your choice answer in the CA test answer book mentioning question number and subdivision number.

i. Decision Tree learning determines values of

A)relations **B)** hypothesis of model **C)** attributes **D)** concepts

ii. A Moral graph in Bayesian networks is created by

A)removing ancestors **B)** marrying parents **C)** marrying children **D)** reversing direction

iii. "Bag of words" approach uses

A) frequency of words **B)** order of words **C)** inverse frequency of words
D) number of words in document

iv. Reinforcement learning uses

A)Immediate rewards **B)** Additive rewards **C)** Discounted rewards **D)** Zero rewards

Fill in the blanks questions in the CA test answer book mentioning question number and subdivision number.

v. Hierarchical Task network planning is used when the problem domain is ..... and .....

vi. Repair is used in the ..... planning approach

vii. Natural languages are a type of Context ..... grammar

b. **(2 x 5 marks = 10 marks)**

i. Consider the text "I want to print Ravi's file created on 21st Oct 24", made by Srinivas to an interface. Analyze how this statement will be processes in the various phases of a Natural Language processing system to derive the actual meaning of the statement.

ii. Draw a decision tree for choosing when to play cricket based on the Weather, Exam schedule, and Distance to ground. Weather can be either Rainy, Cloudy, Hot, Warm, Cold. Exam schedule can be either Tomorrow, Next week, Next month, Distance to ground can be either Near, A little away, Far away. Make a table showing your choices to play cricket given the various options and then learn a decision tree that shows the application choosing the correct option to play cricket

c. **(1 x 10 marks = 10 marks)**

i. Describe the components of Natural Language Processing

(OR)

ii. a) Describe the Graph Plan algorithm to search for a correct plan. Illustrate the algorithm with an example

b) Draw a Bayesian network for diagnosing the disease "flu", using symptoms like fever, cold, pain, inflammation (swelling)

PSG COLLEGE OF TECHNOLOGY, COIMBATORE - 641 004

Department ofComputer Science and Engineering

BE CSE & 5th Semester

CONTINUOUS ASSESSMENT TEST 3 Date: 23.10.2024

19Z504 –COMPUTER NETWORKS

Time: 1 Hour 15 minutes. **Maximum Marks: 35**

INSTRUCTIONS:

1. Answer **ALL**questions.
2. Question No. 1carries 8 Marks and question No. 2carries 27 Marks
3. In question No. 1, subdivision **a** carries total of 8 marks (one mark for each question).
4. In question No. 2, subdivision **a** carries total of 7 marks (one mark for each question), subdivisions**b(i)**and **b(ii)**carries 5 marks each and subdivision **c** carries 10 marks.
5. Course Outcome Table :

Qn. 1	CO 1 to CO 4	Qn.2	CO5

Group I

1. a **(8 x 1 mark = 8 marks)**

- **Write the alphabet of your choice answer for the questions i,iii,v&vii in the CA test answer book mentioning the question number and subdivision number.**
- **Write the answer for the Fill in the blanks questions ii, iv, vi&viiin the CA test answer book mentioning the question number and subdivision number.**

i. Which of the following device is used to connect similar LAN with the same protocol?

A.Gateways **B.**Routers

C.Switches D. Hubs [L2]

ii.In a network with 25 computers, _____ topology would require the most expensive cabling. [L4]

iiiWhat happens when the sender's window size exceeds the receiver's buffer capacity in the Sliding Window algorithm? [L2]

A) Packet loss and retransmissionB) Congestion avoidance and flow control

C) Error detection and correctionD) Network shutdown

iv.In UDP, the processes identify each other using an abstract locater called [L1]

A. Process IdB. Host Id C. Port number D. Port mapper

v.Distance vector routing algorithm uses _____ to determine the neighbors to construct of its own distance vector. [L2]

A) Incoming value **B)** Outgoing packet

C) Flooding **D)** Echo packet

vi.The class of the following IP addresses: 237.14.2.1 is _____ and 208.35.54.12 is _____ [L2]

vii.Consider an instance of TCP's AIMD algorithm where the window size at the start of the slow start phase is 2MSS and the threshold at the start of the first transmission is 8MSS. Assume that a timeout occurs during the fifth transmission. Find the congestion window at the end of the tenth transmission. [L3]

A) 7MSS **B)** 16 MSS **C)**8 MSS **D)**9 MSS

viii.How many host machines can be connected in a domain with the slash notation given as 200.60.50.35 /25? [L3]

A. 256 B. 25 **C.**128 D. 200

(7 x 1 mark = 7 marks)

Write the alphabet of your choice answer in the CA test answer book mentioning question number and subdivision number.

i. ____is the default port number used by FTP? [L1]

21b) 22c) 80d) 110

ii. If you have to send multimedia data over SMTP it has to be encoded into [L2]

A) Binary **B)** Signal

C) ASCII **D)** Hash

iii.1. Which HTTP version introduced persistent connections? [L2]

a) HTTP/0.9b) HTTP/1.0c) HTTP/1.1d) HTTP/2

iv. Which of the following TCP/IP protocol is used for transferring electronic mail messages from one machine to another? [L1]

A) FTP **B)** SNMP

C) SMTP **D)** RPC

v.SMTP uses the _____ protocol (port 25) for email transmission. [L2]

vi._____ is anexperimental transport layer network protocoldesigned by Google.[L1]

vii. _____ is the HTTP method is used to delete a resource[L2]

b.

(2 x 5 marks = 10 marks)

i.Compare and contrast SMTP, POP3, and IMAP. [L4]

ii.An organization wants to secure its FTP transfers. What protocol would you recommend and why?. [L5]

(1 x 10 marks = 10 marks)

Identify the different domain names used in Internet. How does the name resolution take place in DNS? Explain it with help of a diagram. [L5]

Or

GreenTech Inc., a renewable energy startup, experienced a security breach resulting in unauthorized access to sensitive emails.An unknown attacker compromised an employee's email account, sending malicious emails to clients and partners. [L6]

Investigate the breach and identify vulnerabilities. Recommend measures to prevent future breaches. Discuss how you would implement email encryption and authentication.

CA Test 3
2019 Regulations

PSG COLLEGE OF TECHNOLOGY, COIMBATORE - 641 004

Department of Computer Science and Engineering

BE CSE Semester 5

CONTINUOUS ASSESSMENT TEST 3 Date: 24/10/2024

19Z505 - Object Oriented Analysis and Design

Time: 1 Hour 15 minutes. **Maximum Marks: 35**

INSTRUCTIONS:

1. Answer **ALL** questions.
2. Question No. 1 carries 8 Marks and question No. 2 carries 27 Marks
3. In question No. 1, subdivision **a** carries total of 8 marks (one mark for each question).
4. In question No. 2, subdivision **a** carries total of 7 marks (one mark for each question), subdivisions **b(i)** and **b(ii)** carries 5 marks each and subdivision **c** carries 10 marks.
5. Course Outcome Table :

Qn. 1	CO 1 to 4

Qn.2	CO 5

Group I

1. a **(8 x 1 mark = 8 marks)**

- Write the alphabet of your choice answer for the questions i, iii, v & vii in the CA test answer book mentioning the question number and subdivision number.
- Write the answer for the Fill in the blanks questions ii, iv, vi & viii in the CA test answer book mentioning the question number and subdivision number.

i. Which one of the following is an example of a generic software product ?

A) Microsoft PowerPoint Software B) Samsung Washing Machine Software
C) PSG Attendance Entry Software D) Indian Railway Ticket Booking Software

ii. If a post-condition is violated, this means that a _____ object has not carried out its part of the contract associated with an abstraction.

iii. Which one of the following represents a process or thread in UML?

A) Executable Component B) Runnable Interface C) Thread class D) Active class

iv. _____ states how the world has changed because of the execution of the use case.

v. Which diagram models the life cycle of a single object?

A) State machine B) Sequence C) Object D) Timing

vi. Typically, a message in a collaboration diagram represents a client invoking _____ on a supplier object.

vii. Which of the following is true about object diagrams?

A) They are used to show the dynamic interaction of objects during execution
B) They represent the static structure of the system
C) They are a snapshot of the instances of classes at a specific point in time
D) They show the deployment of software components on hardware nodes

viii. A class with a filled diamond at one end of an association line indicates a _____ relationship, where the class at the diamond end controls the lifecycle of the other class.

2. a **(7 x 1 mark = 7 marks)**

Write the alphabet of your choice answer in the CA test answer book mentioning question number and subdivision number.

i. What is the primary reason to model nodes in a deployment diagram using stereotypes such as <<device>> and <<execution environment>>?

A) To differentiate between hardware and software elements deployed on the system
B) To establish the ownership of artifacts between different developers
C) To simplify the understanding of relationships between classes
D) To define the sequence of interactions between objects

ii. What relationship is primarily used between components in a component diagram?

A) Inheritance B) Usage Dependency C) Association D) Deployment

iii. Which of the following is NOT an artifact type?

A) Execution File B) Configuration file C) Library file D) State

iv. In a package diagram, which type of relationship is used to indicate that one package depends on another?

A) Aggregation B) Composition C) Dependency D) Generalization

Write the answer for the Fill in the blanks questions in the CA test answer book mentioning question number and subdivision number.

v. A component is an _____ unit within a system.

vi. _____ patterns serve as a blueprint for how different classes and objects are combined to form larger structures.

vii. In deployment diagram a _____ usually represent a piece of hardware in the system.

b. **(2 x 5 marks = 10 marks)**

i. Draw UML Deployment Diagram for Book Club Web Application. It should be an instance level deployment diagram with the following components like device node – any Server, execution environment nodes: JSP Server, any servlet container and artifacts of your own choice. Use a protocol like TCP/IP for communication between Client side and Server side. **L4**

ii. List out the elements of package diagram and also identify the dependencies of packages in online shopping system. **L3**

c. **(1 x 10 marks = 10 marks)**

Sketch an UML Component Diagram for the below description: Scenario consists of 3 main subsystems namely: Web store, Warehouse and Accounting. Web store in turn consists of components namely: Search Engine, Shopping Cart and Authentication. Accounting also has some in built components like Orders and Customers. Ports are used for communication between any two components that interacts. 7 interfaces are used to enrich the scenario namely Product Search, Online Shopping, User Session, Search Inventory, Manage Orders, Manage Customers, Manage Inventory. **L6**

(OR)

ii. Create the geometrical shapes square, triangle and circle. Add necessary attributes and a function to calculate area. Apply decorator pattern to change the border colour of the shape. **L5**

CA Test 3

PSG COLLEGE OF TECHNOLOGY, COIMBATORE - 641 004

Department of CSE

BE CSE V SEM

CONTINUOUS ASSESSMENT TEST 3 Date: 24.10.2024

19Z002 - ADVANCED DATA STRUCTURES

Time: 1 Hour 15 minutes. **Maximum Marks: 35**

INSTRUCTIONS:

1. Answer **ALL** questions.
2. Question No. 1 carries 8 Marks and question No. 2 carries 27 Marks
3. In question No. 1, subdivision **a** carries total of 8 marks (one mark for each question).
4. In question No. 2, subdivision **a** carries total of 7 marks (one mark for each question), subdivisions **b(i)** and **b(ii)** carries 5 marks each and subdivision **c** carries 10 marks.
5. _____ Data book / _____table(s) may be permitted.
6. Course Outcome Table :

Qn. 1	CO 1 to 4	Qn.2	CO5

Group I

1. a **(8 x 1 mark = 8 marks)**

- Write the alphabet of your choice answer for the questions i, iii, v & vii in the CA test answer book mentioning the question number and subdivision number.
- Write the answer for the Fill in the blanks questions ii, iv, vi & viii in the CA test answer book mentioning the question number and subdivision number.

i. Van Emde Boas tree on u integers between 0 and u − 1 supports successor queries in
A) O(log u) **B)** O(u) **C)** O(lg lg u) **D)** O(lg u lg lg u) **L1**

ii. In the potential method for amortized analysis, the potential energy should never go _____ **L1**

iii. Which of the following statements about leftist heaps is **NOT** true?
A) A leftist heap is a type of priority queue that maintains a complete binary tree structure.
B) The "rank" of a node in a leftist heap is determined by the shortest distance to a node with no children.
C) Merging two leftist heaps can be performed in O(log n) time.
D) In a leftist heap, the smallest element is always found at the root node. **L2**

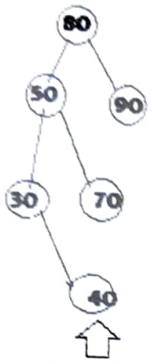
iv. The amortized time complexity for the decrease-key operation in a Fibonacci heap is _____ **L1**

v. Let i be the interval to be searched with high[i] and low[i] representing high and low endpoints of the interval respectively, and let x be a node in interval tree, we can say that there is no overlap in left sub tree if _____

A) Max[left[x]]>low[i]
B) Max[left[x]]>=high[i]
C) Max[left[x]]<low[i]
D) Max[left[x]]<=high[i]

L1

vi The resultant tree after inserting node 40 in the following splay tree is _____



Insert 40

L2

vii. Which of the following statements about point quad trees is **NOT** true?

A) A point quad tree is a data structure used to partition a two-dimensional space into four quadrants.

B) Point quad trees are primarily used for storing line segments rather than individual points.

C) The insertion operation in a point quad tree involves recursively dividing the space into quadrants until a suitable leaf node is found.

D) Point quad trees can efficiently support range searching and nearest neighbor queries.

L1

viii. The KD Tree formed after inserting the points (0.7, 0.2), (0.5, 0.4), (0.2, 0.3), (0.4, 0.7), (0.9, 0.6) is _____

L2

2. a **(7 x 1 mark = 7 marks)**

Write the alphabet of your choice answer in the CA test answer book mentioning question number and subdivision number.

i. Randomized algorithms which always terminate in given time bound, but output the correct answer with at least some (high) probability are called

A) Las Vegas algorithms **B)** Monte Carlo algorithms
C) Sorting algorithm **D)** Greedy algorithm

L1

ii. The expected value if we roll a single die is

A) 3.5 **B)** 6 **C)** 1 **D)** 0.167

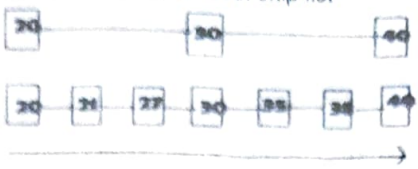
L2

iii. When is the following congruence true? $a^p \bmod p \equiv a \bmod p$

L1

A) a and p must both be prime numbers. **B)** a must be a prime number.
C) a must be a composite number while p must be a prime number.
D) p must be a prime number.

iv. Consider the 2-level skip list L2



How to access 38?

A) Travel 20-30-35-38 B) Travel 20-30-40-38

C) Travel 20-38 D) Travel 20-40-38

Write the answer for the Fill in the blanks questions in the CA test answer book mentioning question number and subdivision number.

v. An algorithm is _____ if its behavior is determined not only by its input but also by values produced by a random-number generator. L1

vi. The _____ of a random variable X is just its average value over S, where each elementary event e is weighted according to its probability. L1

vii. In hiring problem, the total cost of hiring m persons out of the n candidates, if Ci is the cost of interviewing and Ch is the cost of hiring is _____ L2

b. **(2 x 5 marks = 10 marks)**

i. Build a treap by inserting following nodes representing (Key, priority) in sequence. (1, 400), (2,700), (2,200), (5,650), (6,500), (7,600), (8, 100). In the resultant heap insert (9,399). L5

ii. Analyze any three methods of primality testing with example L4

c. **(1 x 10 marks = 10 marks)**

i. Consider the Birthday Paradox: "How many people must there be in a room before there is a 50% chance that two of them were born on the same day of the year?" Solve the Birthday Paradox question using Indicator Random Variables. L6