COLLEGE OF ENGINEERING, PUNE

(An Autonomous Institute of Government of Maharashtra.)

Test 1 Examination

Programme: TY B.Tech | **Semester: VI**

Course Code: CT(DE)-21001 | **Course Name: Advanced Data Structure**

Branch: Computer Engineering & IT | **Academic Year: 2022-2023**

Duration: 1 Hr | **Max Marks: 20**

Student PRN No.

1	1	2	0	0	3	0	1	2

Instructions:

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5. Write your PRN Number on Question Paper.

Marks

Q.1 (a) Find the time complexity of the following : [02]

a)

$$T(n) = 4T(\sqrt{n}) + \lg^5 n$$

b) T(n)=T(n/4)+T(3n/4)+n^2

OR

T(n) = T(n/5) + T(7n/10) + n ?

(b) Arrange the following in increasing order of their time complexity. [02]

A. n
B. 2^√logn
C. 2^2^√loglogn

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Q.2 For each of the functions *f(N)* given below, indicate the tightest bound possible : [03]

A) $f(N) = N^2 \cdot \log_2 (N/2) + N^2$

B) $N \cdot (\log (N^4) - \log N) + N^2$

C) Let $f(n) = \Omega(n)$, $g(n) = o(n)$ and $h(n) = \Theta(n)$
then $[\ f(N).g(n)\ ] + h(n) = ??$

Q.3 Describe the worst case running time of the following pseudocode functions in Big-Oh notation in terms of the variable n : [03]

A)

```
MAIN ()
void ADS (int n, int x, int y)
{for (int i = 0; i < n; ++i)
{
  if (x < y)
      for (int k = 0; k < n * n; ++k){
          System.out.println("k = " + k);
      }
       ELSE
       System.out.println("i = " + i);
}
}
```

B)

```
Main() {
 void Ads (int n)
{
if (n <= 0) return;
 System.out.println("n = " + n);
 Ads (n/2);
 } }
```

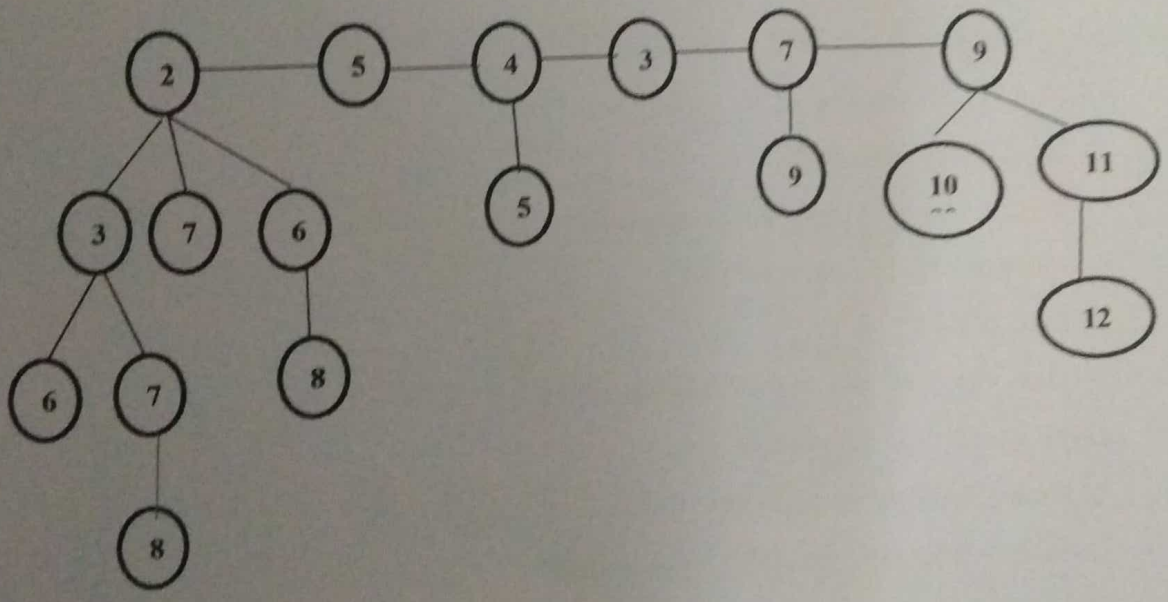
c)

```
Main()
{   for(i=n; i>10; i=i^1/4)
{   for(j=201; j<n^3; j=j+400)
{   for(k=47; k<=n^84; k=k*108)
{
        k=k^61;
} } }
```

Q 4 What will be the Time complexity to apply dijikstra s algorithm using Fibonacci heap, how is it different or better than implementation using min heap, explain. [02]

[01]

Q.5 The figure below shows a single Fibonacci heap. The numbers next to the nodes are the key values. Show how the heap structure changes following a delete min operation. Perform the linking steps from left to right – that is always combine the leftmost pair of trees that are "eligible" to be combined.



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Q.6 a) Draw the leftist heap that results from inserting: 60, 18, 9, 25, 12, 6, 14, 8, 17 in that order into an initially empty heap. What is the null path length of the root in your final heap . [01]

Q.7 Explain the following in the Fibonacci heap : [02]

a) Why mark nodes are there?
b) Why doubly circular linked list is used?

Q.8 a) Suppose algorithm A requires O(n 2) decrease-key operations and O(n) deletemin operations; all remaining steps takes O(n) time. Suppose the decrease-key and delete-min operations are implemented using Fibonacci heaps. [02]
True or False: Algorithm A takes O(n 2) amortized time. Explain.

b) Consider the same scenario as part (a). True or False: Algorithm A takes O(n 2) worst-case time. Explain.

? (a) What output does the below pseudo code produces? [02]

a)

```
function(p1, p2)
    if p1 is Null, return p2
    if p2 is Null, return p1
    // Ensure p1 has higher priority root
    if p1.priority() < p2.priority()
      swap( p1, p2 )
    // Swap the left and right children of p1
    swap( p1.left(), p1.right() )
    // Recursively merge p1's left child with p2; make the
    // merged heap the new left child of p1
    p1.left() = function( p1.left(), p2 )
    return p1
```

b) Fill in the blanks

```
Min (H)
z:= min[H]
if x <> NIL
        then for each child x of z
             do add x to the root list of H
                p[x]:= NIL
             remove z from the root list of H
             if z = right[z]
                then ……..
                else ……..
 return z


ADD(H)
for i:=0 to D(n[H])
     Do A[i] := NIL
for each node w in the root list of H
    do x:= w
       d:= degree[x]
       while A[d] <> NIL
           do y:=A[d]
              if key[x]>key[y]
                then ……..
                Link(H, y, x)
                A[d]:=NIL
                d:=d+1
                A[d]:=x
                min[H]:=NIL
      for i:=0 to D(n[H])
       do if A[i]<> NIL
           then add A[i] to the root list of H
                if min[H] = NIL or
 key[A[i]]<key[min[H]]
                    then …….
```

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Department of Computer and Information Technology

Subject: Design and analysis of algorithms | **Test 2** | **Class: TYCE**

Duration: 1hr | **AY 22-23** | **Date: 18/ 03/2023**

1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
4. Exchange/Sharing of stationery, calculator etc. not allowed.
5. Write your MIS Number on Question Paper

Q.1 Choose appropriate option/s for following. Justify the answer in one or two lines.

1. Which one of the following is the recursive function for finding out longest common subsequence of two different strings, by using dynamic programming approach? If C[i,j] is the cell value from one string to other string. 1

a)
$$c[i,j] = \begin{cases} 0 & \text{if } i,j = 0 \\ c[i-1, j-1] + 1 & \text{if } x_i = y_j \\ \max(c[i-1, j-1], c[i-1, j-1]) & \text{if } x_i \neq y_j \end{cases}$$

b)
$$c[i,j] = \begin{cases} 0 & \text{if } i,j = 0 \\ c[i-1, j-1] + 1 & \text{if } x_i = y_j \\ \max(c[i, j-1], c[i-1, j]) & \text{if } x_i \neq y_j \end{cases}$$

c)
$$c[i,j] = \begin{cases} 0 & \text{if } i,j = 0 \\ c[i, j-1] + c[i-1, j] & \text{if } x_i = y_j \\ \max(c[i, j-1], c[i-1, j]) & \text{if } x_i \neq y_j \end{cases}$$

d) None of these

2. A partially filled table corresponding to a prefix function as L[i] values for a pattern p=ttrrttt is given below. Assume the stating index of pattern is 1 (that is P[1....7]=ttrrttt]. Find the remaining entries in the table. 2

i	1	2	3	4	5	6	7
P[i]	t	t	r	r	t	t	t
L[i]	0	1	0				

a) 1,2,3,4
b) 0,1,2,3
c) 0,1,2,0
d) None of these

3. Working modulo q=11, how many spurious hits (that is , you incorrectly guess that there is a pattern starting at a position) does the rabin-karp matcher encounter in the text T= 31415926535 when looking for a pattern p=26? 2

a) 2
b) 3
c) 5
d) None of these

Q.2 Match the pair/s of worst case time complexity only for string matching for algorithms mantioned in column A with column B, as per our learning in class. Consider m is the length of pattern and n is the length of the text 2

Column A	Column B
a) Naive	i. O(n)
b) Rabin Karp	ii. O(n.m)
c) Finite State Automata	iii. O(n+m)
d) Knuth-Morris-Pratt	iv. O(m)
	v. None of these

Q.3 Write the answers for the following

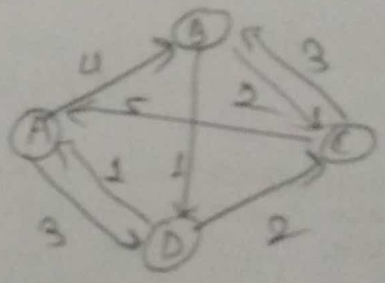
1. Solve the following matrix chain multiplication problem to get minimum scalar multiplications as an optimal solution also calculates the optimal parenthesizing using dynamic programming approach. Given, n is no. of matrices are 5, dimensions set for all 5 matrices as $r=\{r_0,r_1,r_2,r_3,r_4,r_5\}=\{8,3,2,19,18,7\}$. 6

2. For a given pair of intergers (a,b) Euclid's extended algorithm finds the triplet (d,x,y) such that d is the GCD of (a,b) and d= ax+by. Compute the values (d,x,y) that the extended euclid's algorithm will return for the pair (891, 702) 3

3. Consider the following adjacency matrix for a directed graph G. Draw the graph from the given matrix and solve the problem to get the shortest distance among all pairs of vertices in the graph. Show step by step matrix representation using appropriate dynamic programming algorithm. 4

0	4	∞	3
∞	0	2	1
5	3	0	∞
1	∞	2	0

------*----All The Best-----*-----



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Test 2 Examination

Programme: TY B.Tech

Semester: VI

Course Code: CT(DE)-21001

Course Name: Advanced Data Structure

Branch: Computer Engineering & IT

Academic Year: 2022-2023

Duration: 1 Hr

Max Marks: 20

Student PRN No.

1	1	2	0	0	3	0	1	2

Instructions:

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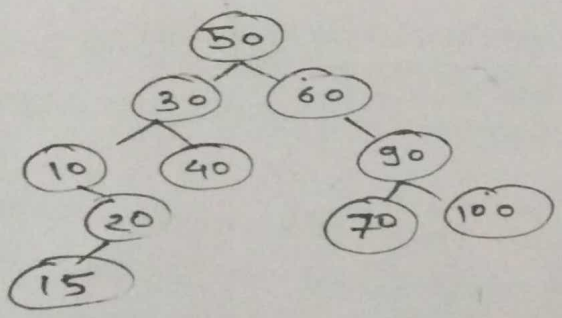
5. Write your PRN Number on Question Paper.

			Marks
Q.1	(a)	What will be the time complexity to perform m splay operations. Explain.	[01]
	(b)	Perform search operation for element 80 in below splay tree. Show the tree after operation. Delete the root element (can use either bottom up/top down)	[02]



Q.2 Insert elements 9,2,90,53,4 in an empty splay tree using top down splaying [02]

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Q 3 A) Perform letter by letter insertion of "A, L, G, O, R, I, T, H, M, S "in an empty 2-3-4 tree. [03]

B) Perform letter by letter insertion of A,M,T,C,H,J,B,I,R,K in an empty ~~splay tree~~ 2-3-4

Q.4 Perform letter by letter deletion "A L G O R I T H M S" of 2-3-4 tree from Q.3A) [02]

Q.5 A) In an empty skip list insert 12,17,20,25,31,32,33,44,50,55, Where Head Tail order is: 12 – 1T ,17 – 3H, 1 T , 20 – 1 T, 25 – 2H, 1T , 31 – 1H 1 T, , 32 – 1 T, 33- 1T, 44- 1T, 50- 1T, 55- 2H,1T. What will be the no of comparisons for inserting 35 -3H and lookup 26. [02]

B) What could be the expected number of levels in a skip list. Show in detail. [02]

Q.6

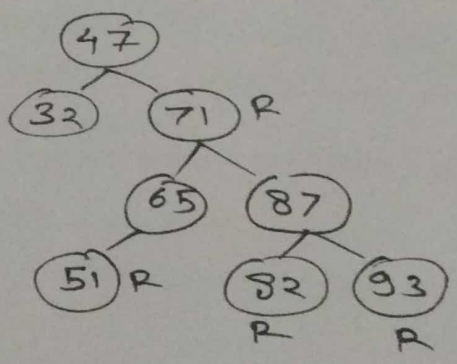
A) What is the node structure of a trie node . Make a trie data structure of words candle, canary, can, lion, cancel, cancellation. [02]

Q.7

A) Insert 2 1 4 5 9 3 6 7 in an empty Red black tree. Show the final tree. [02]

B) Delete 71 and 32 from the below Red Black tree. [02]

Delete 71



MIS Number 1 1 2 0 0 3 0 1 2

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Test T2 Examination

Ethical Hacking

Programme : T. Y. B. Tech.	**Semester : VI**
Branch : Computer Engineering	**Academic Year : 2022-23**
Duration : 1 Hr	**Max Marks : 20**

Instructions:

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4. *Exchange/Sharing of stationery, calculator etc. not allowed.*
5. *Write your MIS Number on Question Paper*

			Marks
Q.1	**A)**	What is a network vulnerability? What are different types of network vulnerabilities?	**[05]**
	B)	How do privilege escalation attacks work? Why is it important to prevent privilege escalation attacks? JAC DDOS	**[05]**
Q.2	**A)**	What is domain name system (DNS) spoofing ? Describe the methods for executing a DNS spoofing attack performed by hackers?	**[05]**
	B)	Describe the phases of social engineering attack? Enlist commonly the target area of hackers to perform phishing attack?	**[05]**

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END Semester Examination

(IOC-21010) Digital Image Processing Applications

Course: B.Tech , Semester VI

Academic Year: 2022-2023

Max Marks 60

Duration: 3 Hours

Date: 24/04/2023

Instructions: **Student MIS No.** 1 1 2 0 0 3 0 1 2

1. Figures to the right indicate the full marks.
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3. Writing anything on question paper is not allowed.
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5. Write your MIS Number on Question Paper

		Marks	CO	PO
Q1 a	Define the following terms: a. Spatial Resolution b. Intensity Level Resolution Calculate the bit depth for the following ranges of gray levels: a. Gray level range: 0 to 255 b. Gray level range: 0 to 65535	4	1	2,3
b	Distinguish between the following types of images based on the number of pixels/ samples per pixel or per point: a. Binary image b. Grayscale image c. RGBA image	3	1	2
c	Image 1 is as shown in figure (a). Image 2 is formed by shuffling the pixels of image 1 and is shown in figure (b). Will there be any change in the histogram? Justify your answer.	3	2	2

Image 1

1	2	4	8
3	5	7	9
4	2	4	6
9	7	3	5

Figure(a)

Image 2

9	7	3	5
3	5	7	9
1	2	4	8
4	2	4	6

Figure(b)

Can two different images have the same histogram? Justify your answer

d What is the value of the marked pixel after a 5×5 median filter?

2	1	3	4	5
1	1	0	2	3
2	0	(0)	1	2
5	1	2	3	1
4	3	1	2	0

When can median filtering be used?

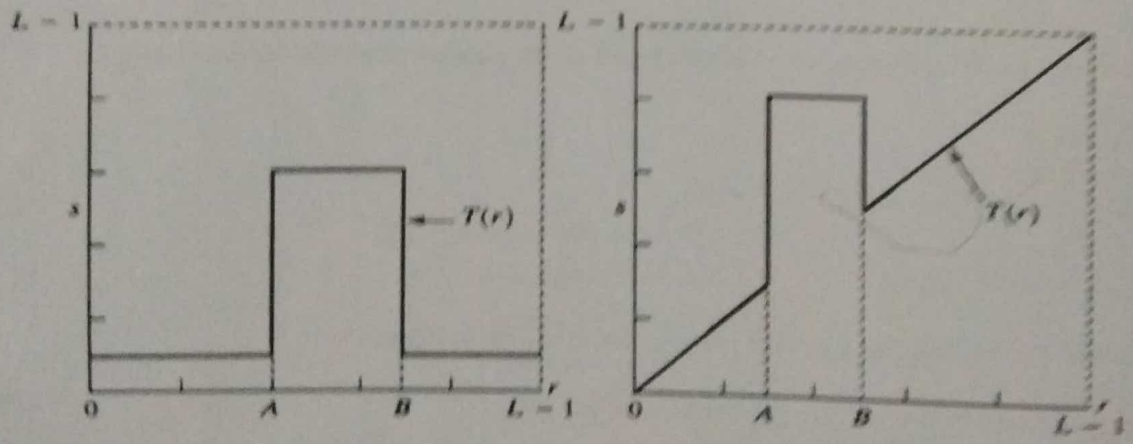
Q2 a Equalize the given image data.

100	100	100	100	10	10
100	100	100	100	10	10
100	100	100	100	10	10
100	100	100	100	100	100
100	100	100	100	100	100
100	100	100	100	100	100

b What is the effect of the following intensity transformation functions:

a. Image Negation
b. Log Transformation and Inverse Log Transformation
c. Power Law Transformation ($\gamma>1$ and $\gamma<1$)

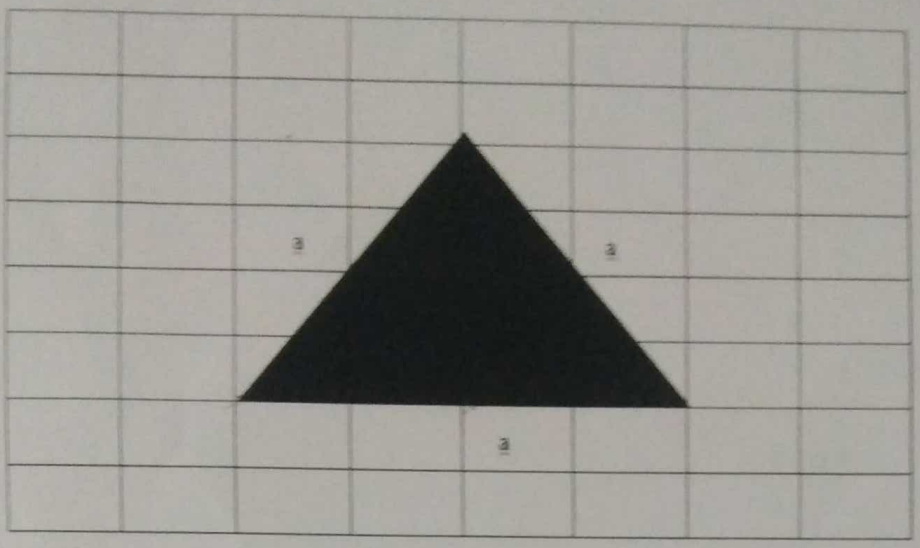
c What is the effect of the following transformation functions:



Q3 a Briefly explain how the following image segmentation algorithms work and discuss their respective advantages and disadvantages.

a. Global thresholding
b. Region splitting and merging

b Sketch the signature of an equilateral triangle with length 'a' shown in figure below. Note: Mention the start point assumption that you consider while solving this problem. 5 3 4



c. For a given data of an image below, find the first and second order moment. 5 3 2,3

100	100	100	100	10	10
100	100	100	100	10	10
100	100	100	100	10	10
100	100	100	100	100	100
100	100	100	100	100	100
100	100	100	100	100	100

d What is a co-occurance matrix? How it helps in finding features of an image? 5 3 4

OR

If the intensity of first four pixels of an image is {0, 1, 2, 3}, find the Fourier description of these intensities using a 4-point kernel.

Q4 a What are tristimulus values? 4 4 2,4
What is Chromaticity Diagram? Explain the significance.
What is a color space? State any four color spaces

b What is meant by pseudo-coloring? 3 4 4
For what purpose is it useful? Explain how a pseudo colored image can be obtained?

Q5 a What is the need for Image Compression 4 4 2,4
Explain in brief any two types of Redundancy.

b What is the difference between Lossless and Lossy Compression. Give examples of each compression schemes. 3 4 3

c Draw the block diagram of an Automated Pattern Recognition system. 3 4 3
How are object recognition methods classified?

OR

State the components of an Artificial Neural Network.
What is the difference between Supervised and Unsupervised Learning methods.

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END Semester Examination

Programme: B.Tech | **Semester: VI**

Course Code: AS (HS)-21007 | **Course Name: Engineering Economics**

Branch: All branches | **Academic Year: 2022-23**

Duration: 2.5 hours | **Max Marks: 60**

Student PRN No.

1	1	2	0	0	3	0	1	2

Instructions:

1. Figures to the right indicate the full marks.
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5. Write your PRN Number on Question Paper.

		SECTION 1 (20 marks)	Marks	CO
Q 1	a	What are the 2 approaches to measuring a nation's GDP? Define Real and Nominal GDP, which is a better measure and why?	2	1
	b	Indias' GDP in FY 2022-23 was US$3.30 trillion and USAs' GDP is $25.46 trillion. Does it mean Americans have higher level of well-being than Indians? Explain in detail.	3	
Q 2	a	Define a business cycle and its stages with a diagram. Explain what happens during each phase of the cycle with: i. GDP ii. Production iii. Employment iv. Inflation v. Aggregate Demand and Aggregate Supply	5	1
Q 3	a	You are a recently graduated Economist of the Country of Utopia. You have started working as an Analyst at Young and Ernest, a consulting firm. Your boss gives you the following national income accounts of the Economy of Utopia. She asks you to find the answers to the questions given.	10	2,3

Indirect Business Taxes	₹919.0
Corporate profits	₹1208.9
Corporate profits taxes	₹469.4
Retained earnings	₹330.8
Proprietors' income	₹1038.4
Rental Income	₹62.1
Net Interest	₹1171.1

		Exports ₹1685.7 Imports ₹2380.4 Income Receipts from rest of world ₹855.6 Income Payments to rest of world ₹754.9 Net National Product ₹12380.8 Government expenditures for Goods and Services ₹2716.5 Personal current Transfer receipts ₹1742.3 Personal Taxes (employee & employer) ₹981.5 Personal Consumption expenditures ₹9785.7 Gross Private Domestic Investment ₹2162.9 Disposable personal income ₹10257.5 i. Find National Income ii. Find GDP, you know that GDP=National Income + Consumption of Fixed Capital + Factor income to abroad + Indirect Taxes - Subsidies iii. Find Wages and Salaries. iv. Find Personal Income and Personal Savings v. Income Tax		
		SECTION 2 (10)		
Q 4	a	What is a perfectly competitive market? Give atleast 5 criteria and an example to describe it.	5	1,2, 3
Q 5	a	The Indian packaged milk market is a Monopoly! present your argument for OR against this statement.	5	1,2, 3
		SECTION 3 (30)		
Q 6	a	Define what is Balance of Payments and Balance of Trade. Describe in brief using an example, what creates a disequilibrium in BOP.	10	1,2
Q 7	a	Suppose the Koreans suddenly develop a taste for Indian Made cosmetic products. What happens to the DEMAND and VALUE for the **Rupee** in the foreign currency market? What happens to the quantity of net exports from India?	10	3,4
Q 8	a	India is an open Economy! What does this statement mean in terms of international trade and foreign currency. Would you recommend a policy of protecting local businesses or free trade for India's development?	10	1,3, 4

COLLEGE OF ENGINEERING, PUNE

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END Semester Examination

(CT-21014) Design and Analysis of Algorithms

Course: B.Tech , Semester VI Branch: Computer Engineering

Academic Year: 2022-2023 Max.Marks:60

Duration: 3 Hours Date: 30/04/2023

Instructions: **Student MIS No.** 1 1 2 0 0 3 0 1 2

1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
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5. Write your MIS Number on Question Paper
6. Figures to the right side are marks, co and po mappings respectively

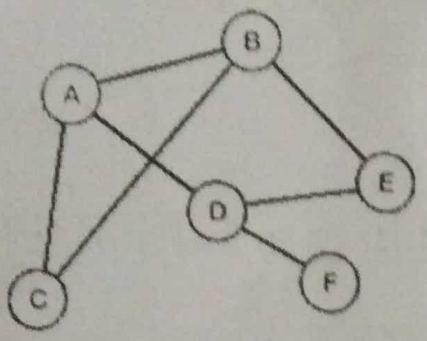
			Marks	CO	PO
Q 1	a	Suppose you are choosing between the following two algorithms: i. Algorithm A solves problems by dividing them into five subproblems of half the size, recursively solving each subproblem, and then combining the solution in linear time. ii. Algorithm B solves problems of size n by recursively solving two subproblems of size n-1 and then combining the solutions in constant time. What are the recursive functions and running times of each of these algorithms (in big-O notation)?	4	1,2	2
	b	A professor has a list of roll numbers and names of students in increasing order of roll numbers. The professor circulates a blank attendance sheet to take attendance of students present for a quiz. The attendance sheet contains roll numbers and signatures of students in random order. Write an algorithm to find out the names of students absent for the quiz. Mention the design technique used by you for the algorithm.	2	2	2
	c	Encode the string "college of engineering pune", using Huffman coding . what is the code and code length for the string "ceriel" using codeword formed? Assume ' '(space) is also one of the alphabets.	3	3	2
	d	Following algorithms compute the value of n^2 for a given integer n. What are their time complexities? Which one is better?	3	3	2

(i)
```
Algorithm sum1 (n)
{
   sum = 0;
   for i = 1 to n do
      sum = sum + 1;
   return sum;
}
```

(ii)
```
Algorithm sum2 (n)
{
   sum = n * n;
   return sum;
}
```

(iii)
```
Algorithm sum3 (n)
{
   sum = 0;
   for i = 1 to n do
      for j = 1 to n do
         sum = sum +1;
   return sum;
}
```

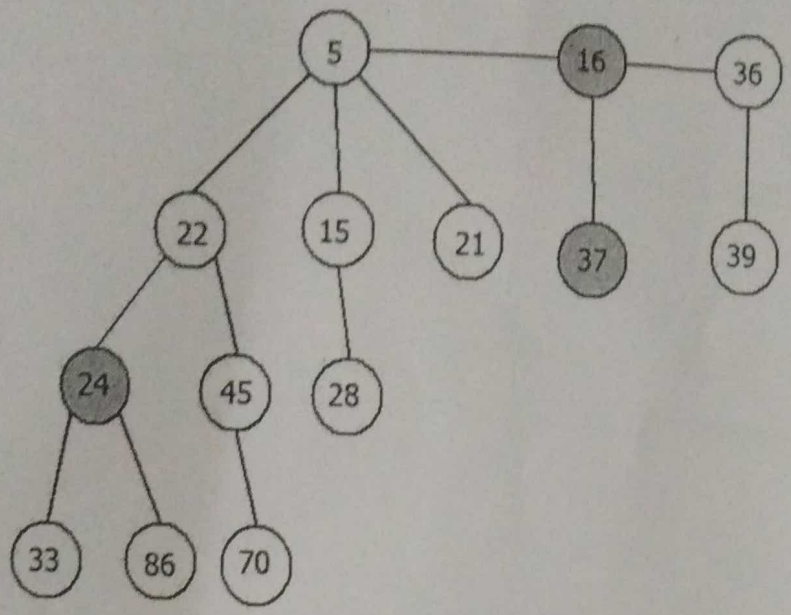
Q 2	a	Apply the backtracking algorithm to color the following graph and write the chromatic number for the same (it is a minimum required number to color the vertices so that no two adjacent vertices has the same color).	3	3,4	2



	b	Rohan knows that a palindrome is a string that if written and read in reverse with original it will be same, he read the word written on his friend's car as "myracarcar" , Help him to know following things, using dynamic programming approach:		3,4	1
		i. What is the length of longest common palindrome does this word has? Help rohan to calculate the same?	1		
		ii. How many such longest common palindromes are there in this word?	1		
		iii. List out those all longest common palindromes available in this word.	1		
	c	A salesperson need to visit 4 different cities and need to come back to same city again with minimum distance travelled. Following is the matrix of distance of cities which are connected. Solve the following instance of travelling sales person problem using dynamic programming approach	5	3,4	1

$$\begin{bmatrix} \infty & 12 & 5 & 7 \\ 11 & \infty & 13 & 6 \\ 4 & 9 & \infty & 18 \\ 10 & 3 & 2 & \infty \end{bmatrix}$$

Q 3	a	Let us assume that W_i=[5,10,15,20,25] and W=30. What are the different combinations of subsets possible to get sum as W? Solve the problem by using backtracking approach. Show the state space tree for the same	4	3,4	2
	b	Construct the string matching finite automata machine for the pattern P = aabab and illustrate its operation on the text string T = aaababaabaababaab	3	4	3
	c	Using Euclidian algorithm calculate GCD of the pair (72345, 43215) Also calculate the multiplicative inverse for the same.	5	4	2
Q 4	a	Consider the Fibonacci heap shown in figure below,where node 16,37,24 are marked nodes. Decrease key 45 to 13, and show step by step pictorial presentation for decrease and consolidate operation.	5	4	2



b Write the potential function for the above Fibonacci heap. What is the amortized cost of the answer Fibonacci heap — 3 4 2

c Let there be N tasks and N workers. The N X N cost matrix is as follows: — 4 4 1

Tasks / Workers	1	2	3
A	18	3	15
B	4	7	14
C	13	12	7

Solve the above assignment problem in order to minimize the task using branch and bound

OR

c Following are the items given with their respective weights and values. An user want to carry items in his knapsack with the capacity as W=6 units, Help him to carry the items so that the total value of his knapsack should be maximum. Solve the problem using branch and bound

Items	Weights	Values
1 pen	2	8
2 book	3	6
3 key	2	4

Q 5 a Explain following with respect to examples — 9 5 3

i. Difference between NP complete and NP hard
ii. Difference Between P and NP
iii. Fibonacci heap and binomial heap

b Show that 3-satisfiability problem is polynomially transformable to the colorability problem. Transform the expression $F = (x_1 + x_2)(x_1' + x_3)$ to a graph with color assignments so that no adjacent vertices have the same color. — 3 5 3

OR

b Prove the 3CNF satisfiability problem can be reduced to Clique decision problem by showing it to be polynomially transformable from CNF satisfiability problem. Transform the expression F = (y1 + y2') (y2 + y3') (y3 + y1') into a graph and list the cliques in it.

---All the Best---

COLLEGE OF ENGINEERING, PUNE

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END Semester Examination

Programme: B.Tech | **Semester:** VI

Course Code: (CT-21015) | **Course Name:** Software Engineering Mini Project Stage- II

Branch: T.Y. B.Tech(Computer) | **Academic Year:** 2022-23

Duration: 2hrs | **Max Marks: 40**

Student PRN No.

1	1	2	0	0	3	0	1	2

Instructions:

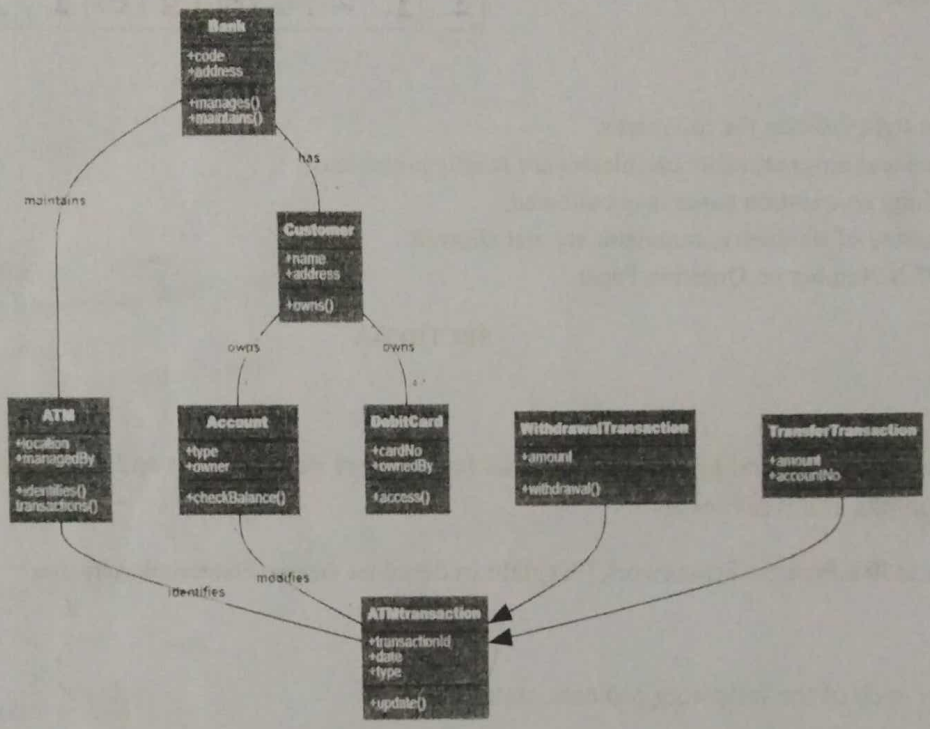
1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
4. Exchange/Sharing of stationery, calculator etc. not allowed.
5. Write your PRN Number on Question Paper.

SECTION-A

			Marks	CO	PO
Q 1	a	Describe the Spiral process model used for software development and discuss its strengths and weaknesses.	5	1,4 ,5	a,d
	b	What is a Process Framework? Explain in detail the Generic Framework Activities?	5	1,2 ,3	c,d ,e
		OR			
Q1		For each of the following projects, state (a) What generic software process model you would employ and (b) what features of the project are best suited to the chosen model. (i) An online Call Routing Management (CRM) software module that provides both routing and voice fidelity capabilities to a voice network exchange centre. (ii) An Air-traffic Message Handling System (AMHS) which provides air traffic controllers at an airport with message exchanges from arriving and departing aircrafts. (iii) A navigation and control software module for driverless hybrid electric vehicles.	10	1,2 ,3, 4,5	a,b ,c, d,e
Q2	a	Applying decomposition develop three levels of DFDs for online food ordering system.	5	3,4	c,d
	b	What are DFDs? Explain various components used in developing the DFD of a given system with the help of an example.	5	1,2	a,b ,c,f

SECTION-B

Q 3	a	Calculate FPA(Function Point Analysis) if all CAF(Complexity Adjustment Factor) are significant for the following count values EI=12, EO=34, EQ=46, EIF=14, ILF=22.	5	4,5	b,d ,g
	b	Develop below listed UML diagrams using the structural view of the banking system shown.	5	3,4 ,5	a,d ,g



a. Use Case diagram
b. Sequence Diagram
c. Activity diagram
d. Component diagram
e. Deployment diagram

Q 4	a	A software company needs to develop a project that is estimated as 1000 function points and is planning to use JAVA as the programming language whose approximate lines of code per function point is accepted as 50. Considering a=1.4, b=1.0, c=3.0, d=0.33 for basic COCOMO, estimate the duration to complete the project.	3	4,5	a,d ,g
	b	Describe following two testing types. a. Regression Testing b. Acceptance Testing	2	1	a,f
	c	Define Software Metrics. Describe three types of software metrics and explain any three outcomes of process which can be measured in order to improve the effectiveness of the process.	5	4,5	b,d ,g

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END Semester Examination

Programme: TY B.Tech

Semester: VI

Course Code: CT(DE)-21001

Course Name: Advanced Data Structures

Branch: Computer Engineering & IT

Academic Year: 2022-2023

Duration: 3 Hrs

Max Marks: 60

Student PRN No.

1	1	2	0	0	3	0	1	2

Instructions:

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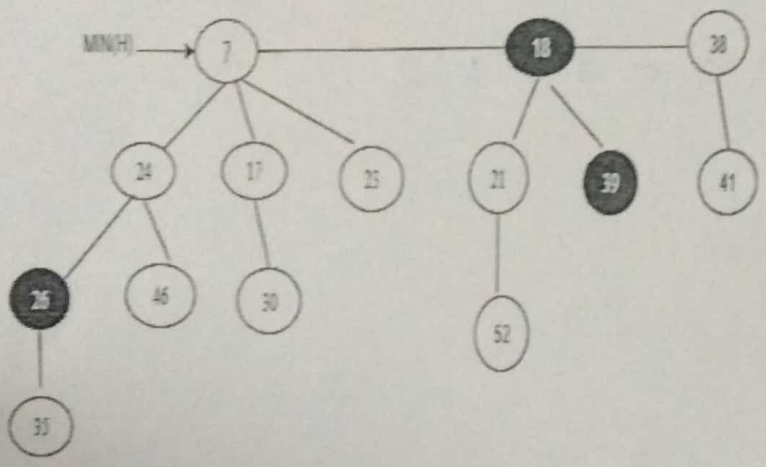
5. Write your PRN Number on Question Paper.

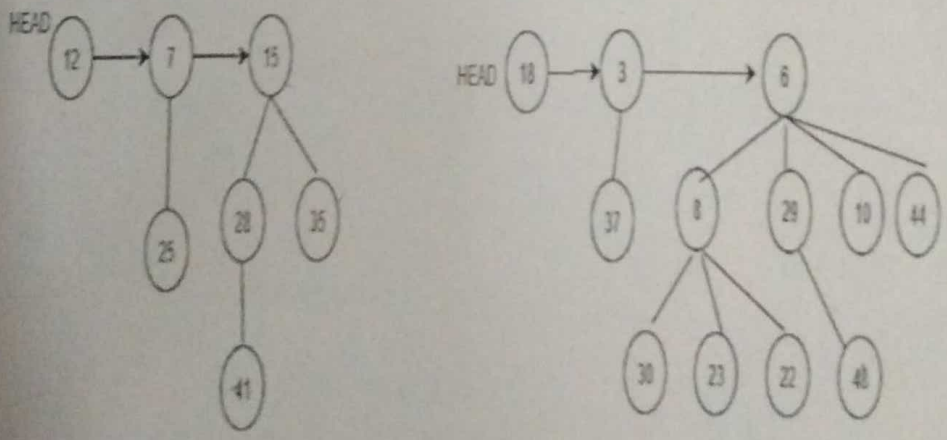
			MARKS	CO	PO
Q.1	A	Use a recursion tree to determine a good asymptotic upper bound on the recurrence – $$T(n) = 4T(\sqrt{n}) + \lg^5 n$$	[04]	2	1
	B	Which among the following grows slowest: 2^logn ,n^10,(√logn) ^log^2n, logn^(√logn), 2^2^(√loglogn)	[04]	2	1
Q.2	A	Fill in the blanks of following algorithm of top -down splaying:	[02]	3	1,4

```
Insert (i)
{if root == null
Insert new node with value I
Else splay at value to be inserted
If  i < key at root
{ create new node with i
 Right (new node) = root
 .....
Left(root) = null
}
If i > key at root
{.....}
}
```

	B	Using the above algorithm insert elements 9, 2, 90, 53, 4, 64, 95, 59.	[04]	3	1,4
	C	Prove that Amortized time complexity to splay x at given root t is: $3\,[(r(t) - r(x)] + 1 = O(\log (s(t)/s(x))$.	[04]	3	1,2
Q.4	A	Decrease key 46 to 15 and 35 to 5 from the following Fibonacci heap and show the resultant Fibonacci heap and its min(H).	[03]	1,3	1,2, 4

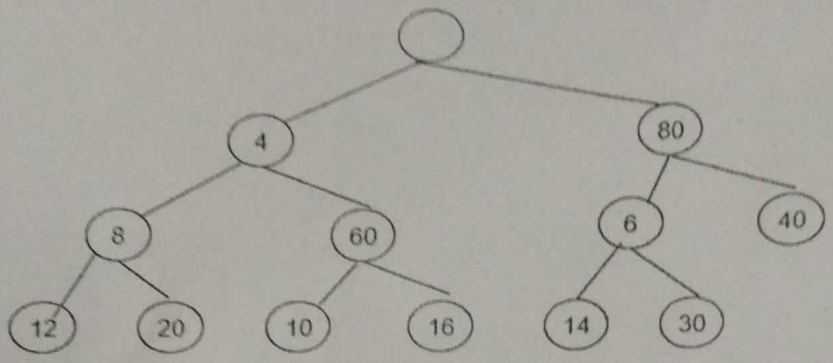


	B	What will be the amortized cost for the above operation.	[03]	1,2	1,2, 4
Q.5	A	Perform the Union operation for the following Binomial Heap:	[04]	1,3	1,2, 6



Q.5	B	Explain The following: i. How trie is applicable in IP Routing decision. ii. Which type of Trie will be best suited to store the index of a search engine and why?	[06]	1,5	1,3

C What are the properties of symmetric min max heap. Insert element 2 in the below SMMH by keeping those properties: [04] 3 1,2, 3



Q.6 An array of elements gives as: [06] 1,2,3 1,7

5	2	1	3	4	6	7	9	8	3

Query: find out the sum of range array[2-8].

A What would be the possible approaches to solve the given query including segment tree approach, compare the time complexity of these methods.

B Build the segment tree for the above query by showing how the three criteria of overlapping/non overlapping will be applied.

Q.7 A A company wants to store the data of service in YY format (year of joining & year of leaving of different employees: [06] 1,5 1,2, 3
10-20, 85-95, 15-25, 70-80, 20-45, 60-90, 30-60, 50-80, 65-75, 80-85, 90-99, 40-50, 5-25, 55-70.

1. construct the interval tree using appropriate data structure for above data.
2. Write an appropriate algorithm for searching of all employees who were on jobs during 20-55.
3. Delete some wrongly entered entries 70-80, 15-25, 30-60,50-80 one by one.

B	Build the KD tree (you can find the median at first level on X co-ordinates, for the next level on Y co-ordinates and so on) for following 2D range data: (3,2) (5,8) (6,1) (9,0) (4,4) (1,1) (2,2) (8,7) How this tree will be different from Balanced binary search tree approach for range query.	[05]	1,2	1,2
C	Explain how the cache oblivious algorithms optimally use the cache.	[05]	1,5	1,2, 4

MIS Number 1 1 2 0 0 3 0 1 2

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END Semester Examination

(CT(HO)-21004) ETHICAL HACKING

Programme : T. Y. B. Tech.	**Semester : VI**
Course Code : CT (HO) -21004	**Course Name : Ethical Hacking**
Branch : Computer Engineering	**Academic Year : 2022-23**
Duration : 3 Hrs	**Max Marks : 60**

Instructions:

1. *Figures to the right indicate the full marks.*
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3. *Writing anything on question paper is not allowed.*
4. *Exchange/Sharing of stationery, calculator etc. not allowed.*
5. *Write your MIS Number on Question Paper*

			M	CO	PO
Q.1		Explain the different process used in ethical hacking? How NIST is more comprehensive than OSSTMM? Justify your answer.	**[10]**	**3,1**	**1,3**
Q.2	**A)**	Illustrate Shared Key Authentication in the 802.11 standard.	**[05]**	**4,3**	**3,5**
	B)	How WEP was less secure than WPA?	**[05]**		
Q.3	**A)**	What is IP spoofing? How to protect against IP spoofing.	**[05]**	**2,3**	**4,7**
	B)	Describe the steps performed for WEP encryption.	**[05]**		

Q.4		What do mean by DoS/DDoS attack? Explain different techniques used by the hacker to create DoS/DDoS attack? How network administrator defense of DoS/DDoS attack in the organization.	[10]	3,5	1,7
Q.5		Explain the types of penetration tests? How vulnerability assessment summary and risk assessment is performed in penetration tests?	[10]	4,5	3,6
Q.6	A)	Illustrate categories of cross site scripting (XSS) attacks with examples.	[05]	1,4	5,8
	B)	What is the significance of payload module in Metasploit? Describe any four payloads availed in Metasploit.	[05]		