Marwadi Education Foundation's Group of Institutions

Answer Book

Enrolment No.

9	2	2	0	0	1	3	3	0	3	0	

Aryandi
Student's Signature

Supervisor's Signature

Supervisor's Name: NA

Seat No.

MB-16

Affix the Barcode Sticker Here after reading the Instructions for Candidates on Page-2

Main	Suppli.	Total
1	+ 2 =	3

Subject Name	DAA
Subject Code	0 1 C T 0 5 1 2 - -
Date of Exam	2 7 - 0 9 - 2 0 2 4
Semester	5th
Course Name	B. Tech - ICT

PART - I (To be Filled by Examiner only)

Question No.	Marks by Examiner	Marks by Verifier-I	Marks by Verifier-II	For the use of University
1	8.75			
2	3.5		31.75 = 32/50	
3	4.0			
4	12.5			
5				
6				
7				
Total Marks Obtained				Signature of Supervisor (Incase of student registered under unfair Means)
Total Marks rounded				Signature of Sr.Supervisor (Incase of student registered under unfair Means)
Total Marks in words				

Jr. Supervisor Information

Name : NA	Date : 27/9	Sign :

Examiner Information

Name :	Date :	Sign :

IMPORTANT NOTE : Examiner is required to enter marks in LED form.

Que. 1	Que. 2	Que. 3	Que. 4	Que. 5	Que. 6	Que. 7	Total

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Marwadi education foundation
Marwadi UNIVERSITY

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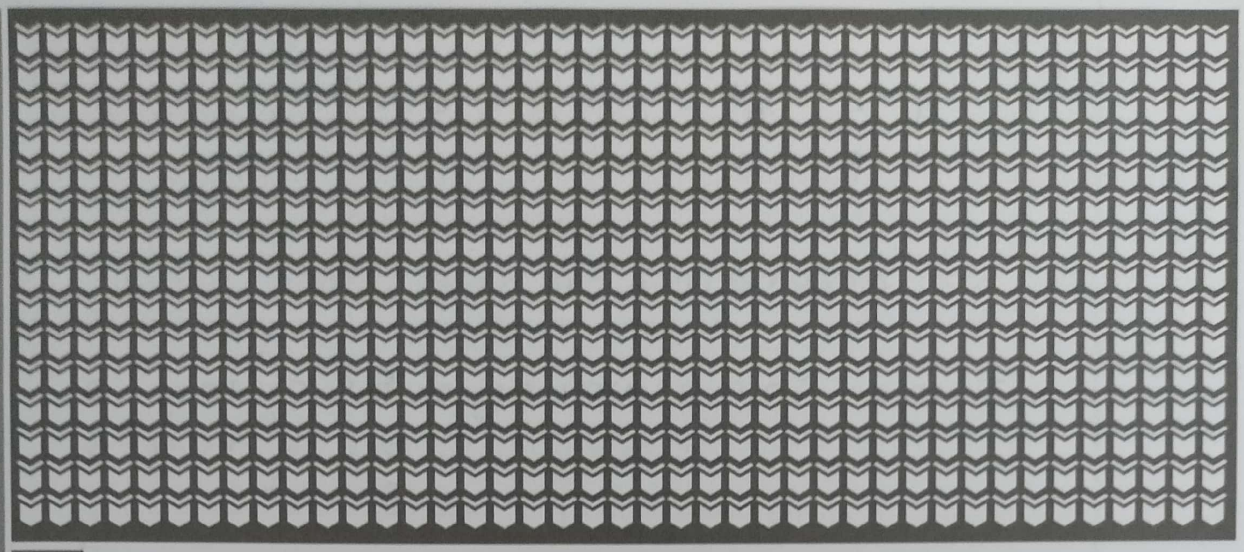

Q. No.

Question - 1

Ans - 1

For a Sorted array, Binary Search is the most optimized algo. having Time Complexity O(log n)

Ans - 2

The tight bound complexity :-

$\theta(n^7)$ $\Omega(n^7)$ 0.5

Ans - 3

Recurrence Relation :-

$T(n) = 3T(n/5) + n^2$

$a = 3, \quad b = 5, \quad k = 2, \quad p = 0$

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Q. No.

$a < b^k$ (i.e. $3 < 5^2$)

and $p = 0$

so according to the case - 3a

Time complexity $\Rightarrow \Theta(n^k \log^p n)$

$\Theta(n^2 \log^0 n)$

$\Theta(n^2)$

Ans - 4

→ For inserting a node at the beginning of Linked List will be $O(1)$ (1)

Ans - 5

The time complexity will be $\Theta(\min(k(N-k)))$ $O(n)$ (1)

Ans - 6

→ If input size doubles then the TC will remain same which is $O(n^2)$ (1)

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Q. No.

Ans - 7

1

Time complexity to insert the already a element in the array O(n-k) ≈ O(n)

where n → input size
k → position

because we have to move each element one position right side after k^th position.

Ans - 8

0.75

Array → O(k) O(1)
LinkedList → O(k)
stack → O(k)
Queue → O(k)

Ans - 9

newPage → O(1)
backward → O(1)
forward → O(1)

1

Ans - 10

enque → O(n) O(1)
deque → O(n)

0.5

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Q. No.

Question - 2

Ans - A

outer loop :- it will run $n/2 - n/4 = n/2$ times

inner loop :- it will run $n - n/4 - 1 - 3n - 4/4$ times

Total operations :- $\frac{n/2 \times 3n-4}{4}$

$\therefore \frac{n(3n-4)}{8}$

$\therefore \frac{3n^2 - 4n}{8}$

$F(n) = \frac{3}{8} n^2 - \frac{n}{2}$

so, the complexity will be :-
$O(n^2)$

Upper bound :- $c_1 . g(n) > F(n)$

$\frac{4}{8} n^2 > \frac{3}{8} n^2 - \frac{n}{2}$

$\frac{1}{8} n^2 > -\frac{n}{2}$

$\frac{1}{8} n^2 + \frac{n}{2} > 0$

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Q No.

$\frac{1}{8}n^2 + \frac{n}{2} > 0$

$2n^2 + 8n > 16$

$2n^2 + 8n - 16 > 0$

$n^2 + 4n - 8 > 0$

$b^2 - 4ac \Rightarrow 16 - 4(1)(-8)$

$16 + 32$

48

$n = \frac{-b + \sqrt{48}}{2}$

Here $\sqrt{48} \approx 6 < 2(n)$

So, the value of n cannot be positive

We can't find upper bound

Ans - B

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8 ☐ + ☐ + ☐ + ☐ + ☐ + ☐ = ☐

Q. No.

Question - 2

Ans- A

$Fcn = (n/2 - n/4) \times \frac{3n-4}{4} \times \log_6 n$

1.5

$= n^2 \log n$

because outer loop of i will run $n/2 - n/4 = n/2$ times

j loop will run $n - n/4 - 1$ times $= 3n-4/4$ times

k loop will run $\log n$ times

So, worst case time complexity $O(n^2 \log n)$

$Fcn = \frac{n}{2} \times \frac{3n-4}{4} \times \log n$

$= \frac{(3n^2 - 4n)}{8} \log n$

$= \frac{3n^2 \log n - 4n \log n}{8}$

$= \frac{3}{8} n^2 \log n - \frac{n}{2} \log n$

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Q. No.

For upper bound

$c_1 g(n) > f(n)$

$\frac{4}{8} n^2 \log n > \frac{3}{8} n^2 \log n - \frac{n \log n}{2}$

$\frac{1}{8} n^2 \log n > -\frac{n \log n}{2}$

$n \log n > -\log n$

$n \log n + \log n > 0$

$(n+1) \log n > 0$

this condition will satisfy for $\forall n > 1$ with $c_1 = 4$

Ans - 2

~~For upper~~

Here $f(n) =$ ~~n~~ n

For upper bound

$c_1 g(n) > f(n)$

$2n > n$

$2n - n > 0$

$n > 0$

Here upper bound $\rightarrow O(n)$

$c_1 = 2$, $n_0 = 1$

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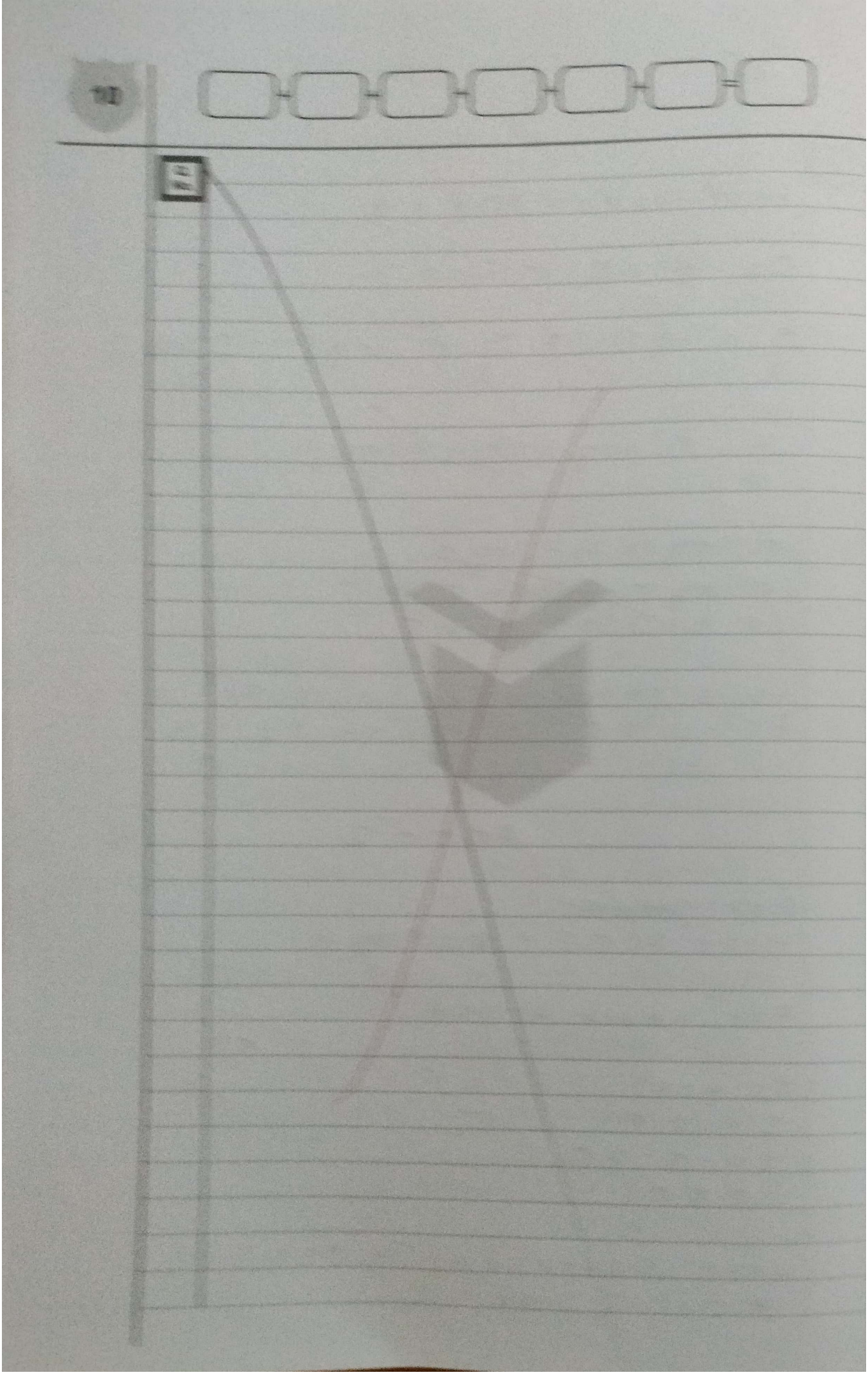

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Q. No.

Question - 3

Ans - 1

$T(n) = 10\,T(n/3) + 2n^{1.5}$

$a = 10$ $\quad k = 1.5$

$b = 3$ $\quad p = 0$

$a > b^k \;\because\; (10 > 3^{1.5})$ (1.5)

So, case - 1 (2)

then $T(n) = \theta(n^{\log_b a})$

$= \theta(n^{\log_3 10})$

$= \theta(n^{1.5})$

Ans - 2

$T(n) = 7T(n/4) + n^2 \log n$

$a = 7$ $\quad k = 2$

$b = 4$ $\quad p = 1$ (2)

$a < b^k \;\because\; (7 < 4^2)$

according to case 3 - a

$T(n) = \theta(n^k \log^p n)$

$= \theta(n^2 \log n)$

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Q No.

Question - 4

Ans - 2

$f(n) = 3\sqrt{n} + 59$

For upper bound

$c \cdot g(n) > f(n)$

For $n \geq n_0$

so, For $c = 4$

$4\sqrt{n} > 3\sqrt{n} + 59$

$\sqrt{n} > 59$

$n > 3481$

Here $c = 4$ and $n = 3481$

$O(\sqrt{n})$

1.5

Ans - 3

$f(n) = 196n^2 + 35$

upper bound

2

$c_2 g(n) > f(n)$

$197n^2 > 196n^2 + 35$

$n^2 > 35$

$n > \sqrt{35}$ $\quad \because \sqrt{35} \approx 5.91$

$n > 5$

$c_1 = 197, \quad n_0 = 5$

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Q. No.

lower bound

$c_2 g(n) < f(n)$

$195 n^2 < 196 n^2 + 35$

$-35 < n^2$

$n^2 > -35$

For any $n > 0$ condition will satisfy

So, $c_2 = 195$, $n = 1$

Here $195 n^2 \leq 196 n^2 + 35 \leq 197 n^2$

So, Worst case $\Rightarrow O(n^2)$

Best case $\Rightarrow O(n^2)$

So, the average case will be $\theta(n^2)$

Hence proved that,

$f(n) = 196 n^2 + 35 \neq \Omega(n^3)$

$\because \Omega(n^2) \neq \Omega(n^3)$

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Q. No.

Ans - 4

$F(n) = 1/2\,(3n^2 - 2n)$

$= 3/2\,n^2 - n$

Upper bound

$c_1 g(n) > F(n)$

$2n^2 > 3/2\,n^2 - n$

$1/2\,n^2 > -n$

$1/2\,n^2 + n > 0$

$n^2 + 2n > 0$

$n(n+2) > 0$

$n = 0$

Here $c_1 = 2$, $n_0 = 1$, $g(n) = n^2$

lower bound

$c_2 g(n) < F(n)$

$n^2 < 3/2\,n^2 - n$

$n < 3/2\,n^2 - n^2$

$1/2\,n^2 > n$

$n^2 > 2n$

$n^2 - 2n > 0$

$n(n-2) > 0$

$n > 0$ or $n > 2$

So $c_2 = 1$, $n_0 = 2$, $g(n) = n^2$

4

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Supplementary

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Subject Name	
Date of Exam	

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Seat No.

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EXAMINER HAS TO COMPULSORY ENTER MARKS IN BOX BELOW ON EACH PAGE

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1

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Q. No.

Hence, $O(n^3)$

Here for $f(n) = 4n^3 + 2n$

O bound will be $O(n^3)$ with

$c_1 = 8$, $c_2 = 1$, $n_0 = 2$, $g(n) = n^3$

Ans = 7

```
def helper(max_wt, food_item):
    for food in food_items:
        if food.
```

2 + + + + + =

Q. No.

1

Ans - 5

Distance (P1, P2) → ??

~~return sqrt((P1.x - P2.x)^2~~

return sqrt(pow(P1.x - P2.x, 2)
    + pow(P1.y - P2.y, 2))

(x, y) ??

Find_Max (Arr)
~~for i in Arr~~
max = Arr[0]
for i in range(1, len(Arr)):
    if Arr[i] > max
        max = Arr[i]

O(n)

return max

~~Fi~~

Divide & Conquer ??

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Q. No.

Divide (Points [ ])

{

left = _

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4 ☐ + ☐ + ☐ + ☐ + ☐ + ☐ = ☐

Q. No.

Ans - 7

~~Select (Food cfood i~~
~~main~~

4

food_items = {'Milk', 65, 4},
{'Butter', 740, 82},
{'cheese', 310, 25},
{'Ice cream', 170, 7}, {'Roasted
Peanuts', 570, 49},
{'Choclate Biscuit', 520, 28},
{'cream', 200, 21}

max_fat = 15

max_cal =

Select Food (food_items, max_
fat)

How??

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Date of Exam	

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Seat No.	
MU	

EXAMINER HAS TO COMPULSORY ENTER MARKS IN BOX BELOW ON EACH PAGE

+ + + + + = 1

Q. No.

Ans - 7

```
def select_food(max_wt, foods):
    cal = 0
    foods[0].calories
    fat = 0
    foods[0].fat
    curr_wt = 100

    for food in foods:
        if(foods[0].calories
```

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```
Select_Food (Food_item max_Cal):
    Sorted_Food = Sort the Food items
                  in decreasing order
                  of Calories/Cal
    max_cal = 0
    For Food in Sorted_Foods
        if
        max_Cal -= Food[0]
        max_cal += Food[1]
    return max_cal

main()
max_Cal = 15
Food_item = [[ ]]
```

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Q. No.

170
516

Rup work 6

sort - func()

selectFood (food_items, max_fat)
sort (food_items . begin(),
food_items . end(), sort_fun

max_fat = 150 123 cal = 170

	cal	fat
Ice cream	170	7
choc bist	520	28
milk	65	4
cheese	310	25
Rosted	570	49
cream	210	21
butter	204	
	740	82

max_fat = 151 , max_cal = 0
144 170
116 686

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4 ▢ + ▢ + ▢ + ▢ + ▢ + ▢ = ▢

Q. No.

Rub work

1 , 2 , 3 , 4 , 5

↑

3 n/2

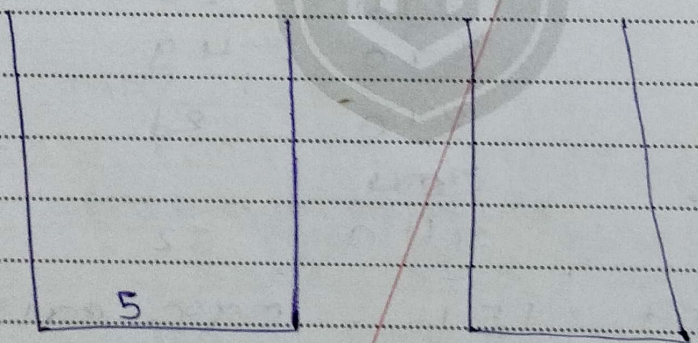
5 - 3 + 1 = 3

For (i = n+1; i >= n-k+1; i--) {

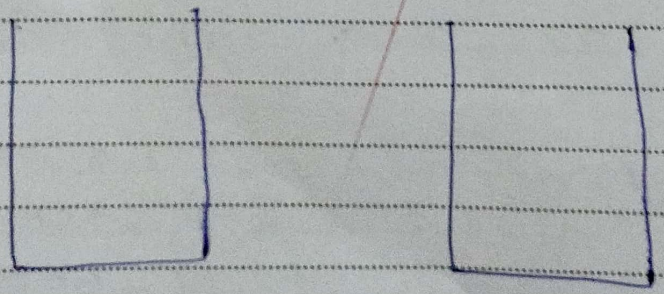
A[i] = A[i-1];

A[i] = key

1 , 2 , 3 , 4 , 5



1 2 3 4 5 OC



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