1. b) $O(\log n)$

2.

3. For $O(n^2)$, ~~the~~ time complexity the largest value will take the most time

so, d) 500

4. length of array $= n$

$i=1 \Rightarrow j: 1, 2, 3, 4, \ldots n$
$i=2 \Rightarrow j: 1, 2, 3, 4, \ldots n$
|
|
|
$i=n \Rightarrow j: 1, 2, 3, \ldots n$

Also, we know that if the loop control variables are independent then

T.C = T.C (loop i) X T.C (loop j)

$T.C = O(n) \times O(n)$
$= O(n^2)$

It uses constant auxilary space

$S.C = O(1)$

5. $T.C = O(n)$
$S.C = O(1)$

6. $T.C = O(n)$
$S.C = O(1)$

8.

$i = 1, 2, \cancel{6}\, 4, 6, 8, 16, \ldots$

$i = \underbrace{1, 2^1, 2^2, 2^3, 2^4, \ldots, 2^x}_{x+1}$

$2^x = n$
$\Rightarrow x = \log_2 n$

$O(x+1)$
$= O(\log_2 n + 1)$
$= O(\log_2 n)$
$= \underline{O(\log n)}$

$S.C = O(1)$, $\because$ ~~No extra auxiliary space~~

9. $T.C = O(n)$
$S.C = O(1)$

12. ~~We know that when~~
Similarly as question 4.

$T.C = O(1k \cdot \text{length}(\text{array}))$
$S.C = O(1)$

15. Let length of array be n

$i = 1 \Rightarrow j : 1$
$i = 2 \Rightarrow j : 1, 2$
$\vdots$
$i = n \Rightarrow j : 1, 2, 3, 4, \ldots n$

Total no. of terms = $1, 2, 3, 4, \dots, n$

$$\frac{n(n+1)}{2}$$

$$O\left(\frac{n^2+n}{2}\right)$$

$$= O\left(\frac{n^2}{2}+\frac{n}{2}\right)$$

$$= O(n^2+n)$$

$\therefore$ T.C $= O(n^2)$

$\therefore$ S.C $= O(1)$

16. Total number of operations

$= n+n$

$= 2n$

$\therefore$ T.C $= O(2n)$

$= O(n)$

$\therefore$ S.C $= O(1)$

18. Similarly like question 4.

T.C = O(length (matrix1). length [matrix2[0]]. length (matrix1[0]))

If, length (matrix1) = m

length (matrix 2[0]) = n

length (matrix 1[0]) = p

T.C = $O(mnp)$

(17)

~~$i=2 \Rightarrow j \Rightarrow 1,2 \Rightarrow k \Rightarrow 1,2$~~

~~$i=3 \Rightarrow j \Rightarrow 1,2,3 \Rightarrow k \Rightarrow 1,2,3$~~

|

|

|

~~$i=n \Rightarrow j=1,2,3,\dots,n \Rightarrow k \Rightarrow 1,2,3,\dots,n$~~

~~T.C =>~~

(19) Total no. of operations

$$= O\left(\frac{n(n+1)(n+2)}{6}\right)$$

$$= O(n^3)$$

S.C = $O(1)$

(20) Outer loop executes $= 2^n$ times
Inner loop executes $= n$ times

$\therefore$ T.C $= O(2^n . n)$

similarly like question 4,

(22) T.C $= O(n.n)$
$= O(n^2)$

S.C $= O(1)$

T.C $= O(n^2)$
S.C $= O(1)$

Let length of array = n

24. $T.C = O\left(\frac{n}{2}\right)$

$= O(n)$

$S.C = O(1)$

25. ~~Log~~ length (matrix) = m
length (matrix [0]) = n

$T.C = O(m.n)$

26. $T.C = O(n)$
$S.C = O(1)$

27. $T.C = O(n)$

28. $T.C = O(\log n)$
$S.C = O(1)$