normalize the sample weights. Write your answer correct to two decimal places.

**Response Type:** Numeric

**Evaluation Required For SA:** Yes

**Show Word Count:** Yes

**Answers Type:** Range

**Text Areas:** PlainText

**Possible Answers:** 

0.08 to 0.12

# **PDSA**

**Section Id:** 64065322347

Section Number: 12

Section type: Online

Mandatory or Optional: Mandatory

Number of Questions: 31

Number of Questions to be attempted: 31

Section Marks: 100

**Display Number Panel:** Yes

**Group All Questions**: No

**Enable Mark as Answered Mark for Review and** 

Maximum Instruction Time: 0

Sub-Section Number: 1

**Sub-Section Id:** 64065351857

**Question Shuffling Allowed:** No

Question Number: 312 Question Id: 640653357330 Question Type: MCQ Is Question

Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

Yes

Time: 0

**Clear Response:** 

#### **Correct Marks: 0**

Question Label: Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "DIPLOMA LEVEL: PROGRAMMING DATA STRUCTURES AND ALGORITHMS USING PYTHON"

ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?
CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.

(IF IT IS NOT THE CORRECT SUBJECT, PLS CHECK THE SECTION AT THE <u>TOP</u> FOR THE SUBJECTS REGISTERED BY YOU)

#### **Options:**

6406531184426. Ves

6406531184427. \* No

Sub-Section Number: 2

**Sub-Section Id:** 64065351858

**Question Shuffling Allowed :** Yes

Question Number: 313 Question Id: 640653357331 Question Type: MCQ Is Question

Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

Time: 0

**Correct Marks: 3** 

Question Label: Multiple Choice Question

Here is a function to return the maximum value in a list of integers. There is a logical error in this function.

```
1  def maxbad(L):
2    mymax = 0
3    for i in range(len(L)):
4        if L[i] > mymax:
5             mymax = L[i]
6    return(mymax)
```

Select the input list for which maxbad produces incorrect output.

#### **Options:**

```
6406531184428. * [-1,3,4,-2]
```

```
6406531184429. * [-1,0,1,2]
```

6406531184430. 🗸 [-1,-2,-3,-4]

6406531184431. \* [4,3,2,1]

Question Number: 314 Question Id: 640653357332 Question Type: MCQ Is Question

Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

Time: 0

**Correct Marks: 3** 

Question Label: Multiple Choice Question

A list having  $2^k$  items has to be processed using either of two given algorithms. Algorithm **A** takes  $8n \log n$  time units and algorithm **B** takes  $0.02n^2$  time units to process a list of n items. What is the smallest value of k for which algorithm **A** would be preferred?

### **Options:**

6406531184432. \* 11

6406531184433. **\*** <sup>12</sup>

6406531184434. **1**3

6406531184435. st Algorithm **A** would always be preferred irrespective of k

Question Number: 315 Question Id: 640653357333 Question Type: MCQ Is Question

Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction

Time: 0

**Correct Marks: 3** 

Question Label: Multiple Choice Question

Consider the following iterative code:

```
1 def fun(n):
2    i,j = 1,1
3    while(j <= n):
4         i = i+2
5         j = j+i
6         print(j)</pre>
```

What would be the running time complexity of the above given function?

## Options:

6406531184436. \*  $O(\log n)$ 

6406531184437. \*  $O(n \log n)$ 

6406531184438.  $\checkmark O(\sqrt{n})$ 

6406531184439. \*  $O(n^2)$ 

Question Number: 316 Question Id: 640653357334 Question Type: MCQ Is Question

Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

Time: 0

**Correct Marks: 3** 

Question Label: Multiple Choice Question

What is the time complexity of the following recurrence relation?

$$T(1) = 1$$

For 
$$n > 1$$
,  $T(n) = 2T(n/4) + n^2$ 

# **Options:**

6406531184440. 
$$\checkmark O(n^2)$$

6406531184441. 
$$\times$$
  $O(n^3)$ 

6406531184442. \* 
$$O(n^2 \log_4 n)$$

```
6406531184443. * O(n^3 \log_4 n)
```

Question Number: 317 Question Id: 640653357335 Question Type: MCQ Is Question

Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

Time: 0

**Correct Marks: 3** 

Question Label: Multiple Choice Question

```
1 def insertionsort(L):
 2
       n = len(L)
       if n < 1:
 3
4
           return(L)
      for i in range(n):
 5
           j = i
           while(j > 0 and L[j] < L[j-1]):
7
                (L[j],L[j-1]) = (L[j-1],L[j])
8
 9
               j = j-1
10
        return(L)
```

Which of the following statement(s) is/are correct with regard to the given Insertion Sort?

- 1. Insertion sort is stable and it sorts in-place
- 2. The complexity of Insertion sort is  $O(n^2)$  in the best case.
- In Insertion sort, after m iterations of the for-loop, the first m elements in the list are in sorted order

#### **Options:**

```
6406531184444. * Only statement 1 is true
6406531184445. * Statement 1 and Statement 2 are true
6406531184446. ✓ Statement 1 and Statement 3 are true
6406531184447. * All statements are true
```

Question Number: 318 Question Id: 640653357336 Question Type: MCQ Is Question

Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

Time: 0

**Correct Marks: 3** 

#### Question Label: Multiple Choice Question

Assuming that the median of n elements can be found in  $O(\log n)$  time. What would be the complexity of quick sort, if the median item is always selected as the pivot?

### **Options:**

```
6406531184448. * O(\log n)
6406531184449. * O(n \log \log n)
6406531184450. \checkmark O(n \log n)
```

Question Number: 319 Question Id: 640653357340 Question Type: MCQ Is Question

Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

Time: 0

Correct Marks: 3

Question Label: Multiple Choice Question

Let G be a undirected connected graph. Let  $T_d$  be a depth-first search tree of G. Let  $T_b$  be a breadth-first search tree of G. Consider the following statements.

- 1. No edge of G is a cross edge with respect to  $T_d$
- 2. For every edge (u,v) of G, if u is at depth i and v is at depth j in  $T_b$ , Then |i-j|=1.

Which of the above statement(s) must necessarily be true?

### **Options:**

6406531184458. ✓ 1 only 6406531184459. ※ 2 only 6406531184460. ※ Both 1 and 2 6406531184461. ※ Neither 1 nor 2

Question Number: 320 Question Id: 640653357341 Question Type: MCQ Is Question

Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

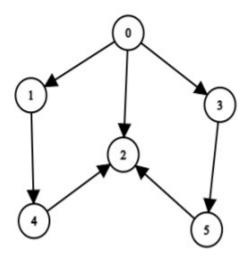
Time: 0

#### **Correct Marks: 3**

Question Label: Multiple Choice Question

Consider the following directed graph. Run DFS on this graph from vertex 0. Which of the following is a cross edge.

Note:- In the case of multiple neighbours, the algorithms first pick the node which has the **smallest** labelled value.



# **Options:**

6406531184462. \* (0,1)

6406531184463. \* (0,3)

6406531184464. 🗸 (5,2)

6406531184465. \* (0, 2)

6406531184466. \* (3, 5)

Question Number: 321 Question Id: 640653357344 Question Type: MCQ Is Question

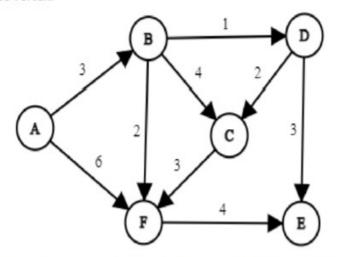
Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

Time: 0

**Correct Marks: 3** 

Question Label: Multiple Choice Question

Consider the following directed weighted graph on which the Dijkstra algorithm is run with vertex as the source vertex.



What is the order of nodes in which the nodes are marked as visited by Dijkstra's algorithm?

### **Options:**

6406531184469. \* A,B,D,F,E,C

6406531184470. \* A,B,D,E,F,C

6406531184471. **¾** A,B,C,D,E,F

6406531184472. ✓ A,B,D,F,C,E

Question Number: 322 Question Id: 640653357345 Question Type: MCQ Is Question

Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction

Time: 0

**Correct Marks: 3** 

Question Label: Multiple Choice Question

Let G = (V, E) is an undirected graph having distinct positive edge weights. Let V be partitioned into two non-empty sets X and Y. Let e = (s, t) be the minimum cost edge, with S belonging to S and S belonging to S. Which one of the following is true?

#### **Options:**

6406531184473. \* Graph G has multiple MCSTs, every MCST must include edge e

6406531184474. \* Graph G has multiple MCSTs, every MCST must exclude edge e

6406531184475. 🗸 Graph G has only one MCST, which must include edge e

Question Number: 323 Question Id: 640653357346 Question Type: MCQ Is Question

Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

Time: 0

**Correct Marks: 3** 

Question Label: Multiple Choice Question

The maximum and the minimum number of nodes possible in a binary search tree of height **6** are\_\_\_\_\_. Consider that the height of the empty tree is 0.

### **Options:**

6406531184477. **4** 63 and 6, respectively

6406531184478. **\*** 64 and 5, respectively

6406531184479. **3** 31 and 6, respectively

6406531184480. **3**2 and 5, respectively

Question Number: 324 Question Id: 640653357347 Question Type: MCQ Is Question

Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

Time: 0

**Correct Marks: 3** 

Question Label: Multiple Choice Question

Consider a complete binary tree with n nodes, where the left and right subtrees of the root are max heaps. The upper bound to convert the tree to a max heap by an efficient algorithm is \_\_\_\_.

# Options:

6406531184482. \* O(n)

6406531184483. \* O(nlogn)

6406531184484. **\***  $O(n^2)$ 

Question Number: 325 Question Id: 640653357348 Question Type: MCQ Is Question

Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

Time: 0

**Correct Marks: 3** 

Question Label: Multiple Choice Question

Consider a binary min-heap made up of {1, 2, 3, 4, ..., 512}. Assume that each number occurs exactly once in the heap. The depth of a node in the heap is equal to the number of edges to that node from the root node. Thus, the root is at depth 0. What is the maximum possible depth of the node number 6?

### **Options:**

6406531184485. \* 8

6406531184486. **\* 7** 

6406531184487. \* 6

6406531184488. **4** 5

Question Number: 326 Question Id: 640653357350 Question Type: MCQ Is Question

Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

Time: 0

Correct Marks: 3

Question Label: Multiple Choice Question

Consider a text file which has probability of occurrence of seven different characters as follows: 0.076, 0.064, 0.030, 0.169, 0.246, 0.2, 0.215. If Huffman coding is used to compress this file, then what will be the average code length of a character?

### **Options:**

6406531184493. \* 3.223

6406531184494. 2.603

6406531184495. \* 1.651

6406531184496. \* 1.341

Question Number: 327 Question Id: 640653357352 Question Type: MCQ Is Question

Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

Time: 0

**Correct Marks: 3** 

Question Label: Multiple Choice Question

There are 5 sorted arrays of sizes 10, 25, 30, 45, and 15. If the merge algorithm is used to optimally combine all of these sorted arrays together into one sorted sequence, then what is the total number of comparisons needed by the optimal merge algorithm in the worst case?

Note: the merge algorithm would merge the arrays pairwise, i.e. it would only merge two arrays into a single larger one

### **Options:**

6406531184498. \* 186

6406531184499. \* 341

6406531184500. 321

6406531184501. 271

Question Number: 328 Question Id: 640653357353 Question Type: MCQ Is Question

Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

Time: 0

Correct Marks: 3

Question Label: Multiple Choice Question

In a list L, two elements L[i] and L[j] form a inversion if L[i] > L[j] and i < j. Which of the following options represents the inversions in the list L = [1,5,4,2,6,3]?

#### **Options:**

```
6406531184502. * (5,4), (5,2), (5,3), (2,1), (4,3), (6,3)
6406531184503. * (5,4), (5,2), (4,2), (5,3), (4,3), (6,3)
6406531184504. * (5,4), (5,3), (2,1), (4,2), (5,2), (6,3)
6406531184505. * (5,1), (5,2), (5,3), (4,2), (3,2), (6,3)
```

Question Number: 329 Question Id: 640653357357 Question Type: MCQ Is Question

Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

Time: 0

**Correct Marks: 3** 

Question Label: Multiple Choice Question

Which of the following option represents the fail function (or prefix function) for pattern

'abcaabca' in the Knuth-Morris-Pratt (KMP) algorithm?

### Options:

6406531184509. \* [1,1,1,1,1,2,3,4]

6406531184510. \* [0,0,0,1,2,2,3,4]

6406531184511. [0,0,0,1,1,2,3,4]

6406531184512. \* [0,0,0,1,1,2,3,1]

Question Number: 330 Question Id: 640653357360 Question Type: MCQ Is Question

Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

Time: 0

**Correct Marks: 3** 

Question Label: Multiple Choice Question

Consider the following statements and select the appropriate option regarding them

- 1. Checking algorithm for the Boolean satisfiability problem is intractable.
- 2. Given a problem  $\alpha$  which is reduced in polynomial time from another problem  $\beta$ . If  $\alpha$  is solvable in polynomial time, then  $\beta$  is also solvable within polynomial time.

# **Options:**

6406531184519. \* Only statement 1 is correct

6406531184520. ✓ Only statement 2 is correct

6406531184521. \* Both the statements are correct

6406531184522. \* Both the statements are wrong

Sub-Section Number: 3

**Sub-Section Id:** 64065351859

**Question Shuffling Allowed:** Yes

Question Number: 331 Question Id: 640653357349 Question Type: MSQ Is Question

Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

Time: 0

**Correct Marks: 3** 

Question Label: Multiple Select Question

Which of the following statement(s) is/are **true**?

### **Options:**

While inserting a new element in a max heap of n elements, a binary search is performed on the path from the new node to the root to find the correct position of the new node. The number of comparisons performed in this process is  $O(\log^2 n)$ 

Given a binary search tree and a min-heap with the same constituent items, the min-heap is more efficient for printing the items in ascending order.

When we implement Prim's algorithm using min-heap, the time complexity is improved to 6406531184491.  $\checkmark$   $O((m+n)\log n)$ .

When we implement Dijkstra's algorithm using min-heap, the time complexity is improved 6406531184492.  $\checkmark$  to  $O((m+n)\log n)$ .

Question Number: 332 Question Id: 640653357358 Question Type: MSQ Is Question

Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

Time: 0

**Correct Marks: 3** 

Question Label: Multiple Select Question

Consider the following problem statement.

There are 15 saree printing machines in a printing press company. Each machine produces 500 sarees and consumes electricity worth Rs 15000 every month. A machine can be overloaded to print more sarees, but it should not be loaded more than 10% of its usual production capacity. Also, when the machine is overloaded, it consumes 20% more electricity. Demand of saree for the  $i^{th}$  month is represented with variables  $d_i|1<=i<12$ . In order to balance demand and production to optimize profit, the company can switch off a machine for a month, but during that month a maintenance charge of Rs 60 is required for that machine. Similarly, in order to switch on a machine that was switched off previously, a startup cost of Rs 40 is required for that machine. The press might produce surplus sarees, the cost to store these surplus sarees is Rs 30 per saree.

Assume we use the following notations for representing the variables required to model this into a LPP problem:

1.  $m_i$ : machines running in month i

2.  $s_i$ : sarees made in month i

3.  $o_i$  : sarees made in overloaded state in month i

4.  $n_i$ : machines started in the start of month i

5.  $x_i$ : machines switched off in the start of month i

6.  $g_i$ : number of surplus sarees at the end of month i

7.  $d_i$ : demand of saree for month i

Identify the correct constraints pertinent to the above problem exclusively from the below options.

# **Options:**

6406531184513. **\*** 
$$s_i = 500m_i + g_i$$

6406531184514. 
$$\checkmark m_i = m_{i-1} + n_i - x_i$$

6406531184515. **\*** 
$$g_i = s_i - d_i$$

$$6406531184516$$
.  $\checkmark m_i <= 15$ 

6406531184517. 
$$\checkmark o_i <= 50 m_i$$

Sub-Section Number: 4

**Sub-Section Id:** 64065351860

**Question Shuffling Allowed :** Yes

Question Number: 333 Question Id: 640653357337 Question Type: MCQ Is Question

Mandatory: No Calculator: None Response Time: N.A Think Time: N.A Minimum Instruction

Time: 0

**Correct Marks: 4** 

Question Label: Multiple Choice Question

Consider the following implementation for Queue.

```
1 class Queue:
 2
       def __init__(self):
 3
            self.queue = []
      def enqueue(self,v):
 4
 5
            self.queue.append(v)
      def isempty(self):
 6
            return(self.queue == [])
 7
      def dequeue(self):
 8
 9
           v = None
           if not self.isempty():
10
              v = self.queue[0]
11
               self.queue = self.queue[1:]
12
           return(v)
13
```

```
1  def fun(Q):
2    if (not Q.isempty()):
3         i = Q.dequeue()
4         fun(Q)
5         Q.enqueue(i)
```

Assuming that the initial state of the queue Q was [12,24,20,40,6,12,8,16], what is Q.queue [3] after fun(Q) is executed?

### **Options:**

6406531184452. **4**0 6406531184453. **6** 6406531184454. **1**2 6406531184455. **1**6

**Sub-Section Number:** 5

**Sub-Section Id:** 64065351861

**Question Shuffling Allowed:** Yes

Question Number: 334 Question Id: 640653357338 Question Type: SA Calculator: None

Response Time: N.A Think Time: N.A Minimum Instruction Time: 0

**Correct Marks: 4** 

Question Label: Short Answer Question

A hash table of size 8 (index 0 to 7) uses open addressing with hash function  $h(k) = k \mod 8$ , and linear probing. The following elements are added into the hash table, which was initially empty.

25,11,84,26,46 and 50

The key value 50 is stored at which index of the hash table?

**Response Type:** Numeric

**Evaluation Required For SA:** Yes

**Show Word Count:** Yes

**Answers Type:** Equal

**Text Areas:** PlainText

**Possible Answers:** 

5

Question Number: 335 Question Id: 640653357339 Question Type: SA Calculator: None

Response Time: N.A Think Time: N.A Minimum Instruction Time: 0

**Correct Marks: 4** 

Question Label: Short Answer Question

Consider a **directed graph** *G* with 55 edges with the least number of vertices possible. What will

be the number of vertices in graph G?

**Response Type:** Numeric

**Evaluation Required For SA:** Yes

**Show Word Count:** Yes

**Answers Type:** Equal

Text Areas: PlainText

**Possible Answers:** 

8

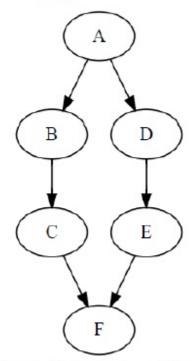
Question Number: 336 Question Id: 640653357342 Question Type: SA Calculator: None

Response Time: N.A Think Time: N.A Minimum Instruction Time: 0

#### **Correct Marks: 4**

Question Label: Short Answer Question

Consider the following directed graph.



The number of different topological orderings of the vertices of the graph is \_\_\_\_\_

Response Type: Numeric

**Evaluation Required For SA:** Yes

**Show Word Count:** Yes

**Answers Type:** Equal

**Text Areas:** PlainText

**Possible Answers:** 

6

Question Number: 337 Question Id: 640653357343 Question Type: SA Calculator: None

Response Time: N.A Think Time: N.A Minimum Instruction Time: 0

**Correct Marks: 4** 

**Question Label: Short Answer Question** 

Consider the following adjacency matrix AMAT of an undirected graph with 5 vertices.

$$AMat = \begin{pmatrix} 0 & 1 & 8 & 1 & 4 \\ 1 & 0 & 12 & 10 & 9 \\ 8 & 12 & 0 & 7 & 3 \\ 1 & 10 & 7 & 0 & 2 \\ 4 & 9 & 3 & 2 & 0 \end{pmatrix}$$

What is the cost of the minimum spanning tree for the given adjacency matrix of a graph?

Response Type: Numeric

**Evaluation Required For SA:** Yes

**Show Word Count:** Yes

**Answers Type:** Equal

Text Areas: PlainText

**Possible Answers:** 

7

Question Number: 338 Question Id: 640653357351 Question Type: SA Calculator: None

Response Time: N.A Think Time: N.A Minimum Instruction Time: 0

**Correct Marks: 4** 

Question Label: Short Answer Question

What will be the minimum number of nodes in an AVL tree of height **7**? Consider that the height of the empty tree is 0.

Response Type: Numeric

**Evaluation Required For SA:** Yes

**Show Word Count:** Yes

**Answers Type:** Equal

**Text Areas :** PlainText

**Possible Answers:** 

33

Question Number: 339 Question Id: 640653357354 Question Type: SA Calculator: None

Response Time: N.A Think Time: N.A Minimum Instruction Time: 0

**Correct Marks: 4** 

**Question Label: Short Answer Question** 

Let A1, A2, A3, A4 be 4 matrices with dimensions  $(10 \times 5), (5 \times 20), (20 \times 10), (10 \times 15)$  respectively. What is the minimum number of scalar multiplications required to find the product  $A1 \times A2 \times A3 \times A4$ ?

Response Type: Numeric

**Evaluation Required For SA:** Yes

**Show Word Count:** Yes

**Answers Type:** Equal

Text Areas: PlainText

**Possible Answers:** 

2500

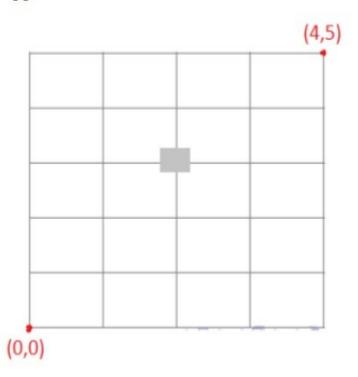
Question Number: 340 Question Id: 640653357355 Question Type: SA Calculator: None

Response Time: N.A Think Time: N.A Minimum Instruction Time: 0

**Correct Marks: 4** 

**Question Label: Short Answer Question** 

Consider the following grid.



How many unique paths are available from (0,0) to (4,5)? The condition is that you can only travel one step right or one step up at a time, and the gray box at intersection points (2,3) represents a blockage.

**Response Type:** Numeric

**Evaluation Required For SA:** Yes

**Show Word Count:** Yes

**Answers Type:** Equal

**Text Areas:** PlainText

**Possible Answers:** 

66

Question Number: 341 Question Id: 640653357356 Question Type: SA Calculator: None

Response Time: N.A Think Time: N.A Minimum Instruction Time: 0

**Correct Marks: 4** 

Question Label: Short Answer Question

Consider the Rabin-Karp algorithm using modulo arithmetic to match the pattern in base 10. Taking modulo q = 11, how many **false positives** matches does the Rabin-Karp matcher encounter while searching pattern 36 in the text 3141592653589363?

Response Type: Numeric

**Evaluation Required For SA:** Yes

**Show Word Count:** Yes

**Answers Type:** Equal

**Text Areas :** PlainText

**Possible Answers:** 

2

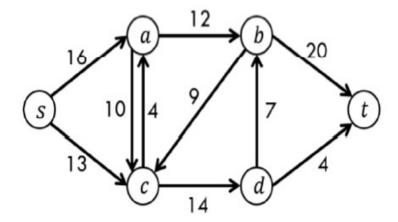
Question Number: 342 Question Id: 640653357359 Question Type: SA Calculator: None

Response Time: N.A Think Time: N.A Minimum Instruction Time: 0

**Correct Marks: 4** 

Question Label: Short Answer Question

#### Consider the following network:



Consider the network given above with source s and sink t, with the numbers on the edges denoting maximum capacity across a particular edge. The value of the maximum flow in the given network is\_\_\_\_\_.

Response Type: Numeric

**Evaluation Required For SA:** Yes

**Show Word Count:** Yes

**Answers Type:** Equal

Text Areas: PlainText

**Possible Answers:** 

23

# **System Commands**

**Section Id:** 64065322348

Section Number: 13

Section type: Online

Mandatory or Optional: Mandatory

Number of Questions: 21

Number of Questions to be attempted: 21

Section Marks: 100

**Display Number Panel :** Yes

**Group All Questions:** No

**Enable Mark as Answered Mark for Review and** Yes