

You're working with a dataset of customer purchase behavior, including attributes "Total Amount Spent" and "Number of Items Purchased." You decide to use K-means clustering to segment customers into groups based on these features. The following code snippet demonstrates the K-means clustering process:

```
from sklearn.cluster import KMeans
import numpy as np

data = np.array([[150, 6], [300, 12], [50, 2], [250, 8], [80, 3]])

# Initialize KMeans with 3 clusters
kmeans = KMeans(n_clusters=3)
kmeans.fit(data)

# Predict cluster labels
labels = kmeans.labels_

# Centroid coordinates of clusters
centroids = kmeans.cluster_centers_
```

Based on the given code and the nature of the dataset, what does the variable 'labels' represent?

Options :

6406532034064. ✖ The total amount spent by each customer.

6406532034065. ✔ The cluster assignments indicating which group each customer belongs to.

6406532034066. ✖ The number of items purchased by each customer.

6406532034067. ✖ The centroid coordinates of the clusters formed.

PDSA

Section Id :	64065341239
Section Number :	11
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	27

Number of Questions to be attempted :	27
Section Marks :	100
Display Number Panel :	Yes
Section Negative Marks :	0
Group All Questions :	No
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	64065387486
Question Shuffling Allowed :	No
Is Section Default? :	null

Question Number : 270 Question Id : 640653608933 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "DIPLOMA LEVEL : PROGRAMMING, DATA STRUCTURES AND ALGORITHMS USING PYTHON (COMPUTER BASED EXAM)"

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 TOP FOR THE SUBJECTS REGISTERED BY YOU)

Options :

6406532034072. ✓ YES

6406532034073. ✗ NO

Sub-Section Number : 2

Sub-Section Id : 64065387487

Question Shuffling Allowed :

Yes

Is Section Default? :

null

Question Number : 271 Question Id : 640653608934 Question Type : MSQ Is Question

Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4 Max. Selectable Options : 0

Question Label : Multiple Select Question

Consider the following growth functions

(a) $f(n) = \log^2 n$

(b) $g(n) = \sqrt{\log n}$

(c) $h(n) = \log \log n$

(d) $s(n) = n \log n$

Choose all the correct option/(s) among the following.

Options :

6406532034074. ✖ $g(n) = O(h(n))$

6406532034075. ✔ $h(n) = O(g(n))$

6406532034076. ✔ $f(n) = O(s(n))$

6406532034077. ✖ $s(n) = O(f(n))$

Question Number : 272 Question Id : 640653608944 Question Type : MSQ Is Question

Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4 Max. Selectable Options : 0

Question Label : Multiple Select Question

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

Options :

64065320341109. ✓ Finding the second smallest in a min-heap takes $O(1)$ time.

64065320341110. ✓ Inserting a new element in a min-heap takes $O(\log n)$ time

64065320341111. ✓ Finding the largest value in a min-heap takes $O(n)$ time.

64065320341112. ✗ Removing the minimum element from a min-heap takes $O(n)$ time

Question Number : 273 Question Id : 640653608948 Question Type : MSQ Is Question

Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4 Max. Selectable Options : 0

Question Label : Multiple Select Question

Let `coins` be a list of `k` coin denominations (positive integers) that are available in unlimited quantities. You want to pay a sum of Rupees `x` using as few coins as possible from the coin denominations given in the list `coins`.

Consider the following greedy strategy:

Sort the coin denominations in descending order, and then repeatedly choose the largest coin denomination that is less than or equal to the remaining amount `x`. We subtract the chosen coin value from `x` and continue this process until `x` becomes zero.

Which of the following are counter-examples which prove that the given greedy strategy is not optimum.

Options :

6406532034123. ✗ `coins = [6, 1, 5, 7]` and `x = 15`

6406532034124. ✗ `coins = [10, 1, 2, 5]` and `x = 25`

6406532034125. ✓ `coins = [1, 2, 8, 9, 5, 10]` and `x = 17`

6406532034126. ✖ coins = [1, 5, 10, 25] and x = 30

6406532034127. ✔ coins = [1, 6, 10, 15] and x = 24

Sub-Section Number :	3
Sub-Section Id :	64065387488
Question Shuffling Allowed :	Yes
Is Section Default? :	null

Question Number : 274 Question Id : 640653608935 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3 Max. Selectable Options : 0

Question Label : Multiple Select Question

Which of the following sorting algorithms will have the same time complexity irrespective of the sequence of elements in the input?

Options :

6406532034078. ✔ Selection Sort

6406532034079. ✔ Merge Sort

6406532034080. ✖ Quick Sort

6406532034081. ✖ Insertion Sort

Sub-Section Number :	4
Sub-Section Id :	64065387489
Question Shuffling Allowed :	Yes
Is Section Default? :	null

Question Number : 275 Question Id : 640653608936 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

```
1 def selectionsort(L):
2     n = len(L)
3     if n < 1:
4         return(L)
5     for i in range(n):
6         mpos = i
7         for j in range(i+1,n):
8             if L[j] < L[mpos]:
9                 mpos = j
10        (L[i],L[mpos]) = (L[mpos],L[i])
11    return(L)
```

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

1. Selection sort is stable sort.
2. It sorts In-place.
3. In Selection sort, after m passes through the list, the first m elements in the list are the m smallest element of the list.

Options :

6406532034082. ✖ Only statement 2 is true

6406532034083. ✖ Statement 1 and Statement 2 are true

6406532034084. ✔ Statement 2 and Statement 3 are true

6406532034085. ✖ Statement 1 and Statement 3 are true

6406532034086. ✖ All statements are true

Question Number : 276 Question Id : 640653608937 Question Type : MCQ Is Question

Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

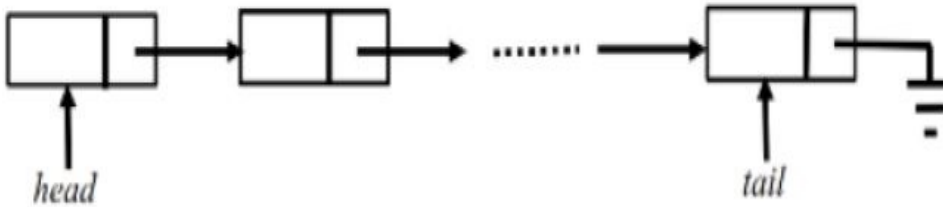
Question Label : Multiple Choice Question

```

1 class Node:
2     def __init__(self, data):
3         self.data = data
4         self.next = None

```

A queue is implemented using a linked list. Each node of the linked list is an object of class `Node`. The queue has a `head` pointer that points to the first node of the linked list and a `tail` pointer that points to the last element of the linked list, as shown in the figure.



Let n denote the number of nodes in the queue. Let `Enqueue` be implemented by inserting a new node at the `head`, and `Dequeue` be implemented by deletion of a node from the `tail`.

Which one of the following is the time complexity of the most time-efficient implementation of `Enqueue` and `Dequeue`, respectively, for this data structure?

Options :

6406532034087. ✖ $O(1), O(1)$

6406532034088. ✔ $O(1), O(n)$

6406532034089. ✖ $O(n), O(1)$

6406532034090. ✖ $O(n), O(n)$

Question Number : 277 Question Id : 640653608938 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

A hash table of size 10 uses open addressing with hash function $h(k) = k \bmod 10$, and linear probing. After inserting 7 values into an empty hash table, the table is as shown below.

Index	Data
0	25
1	
2	22
3	
4	
5	35
6	16
7	77
8	15
9	79

Which of the following options give a possible order in which the key values could have been inserted in the hash table?

Options :

6406532034091. ✖ 79, 22, 35, 15, 16, 77, 25

6406532034092. ✖ 22, 35, 77, 16, 25, 79, 15

6406532034093. ✖ 35, 16, 77, 15, 22, 25, 79

6406532034094. ✔ 77, 79, 16, 35, 15, 22, 25

Question Number : 278 Question Id : 640653608940 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

An airline serves 1000 cities and runs 4500 direct flights each day between these cities. Which of

the following is a good data structure to get the list of cities where direct flight available from any particular cities?

Options :

6406532034099. ✖ A 1000×1000 2d-array A, where $A[i][j] = 1$ if there is a direct flight from city i to city j and 0 otherwise.

6406532034100. ✖ A stack containing values (i, j) for each pair of cities i, j for which there is a direct flight from city i to city j .

6406532034101. ✖ A queue containing values (i, j) for each pair of cities i, j for which there is a direct flight from city i to city j .

6406532034102. ✔ An adjacency list containing values (i, j) for each pair of cities i, j for which there is a direct flight from city i to city j .

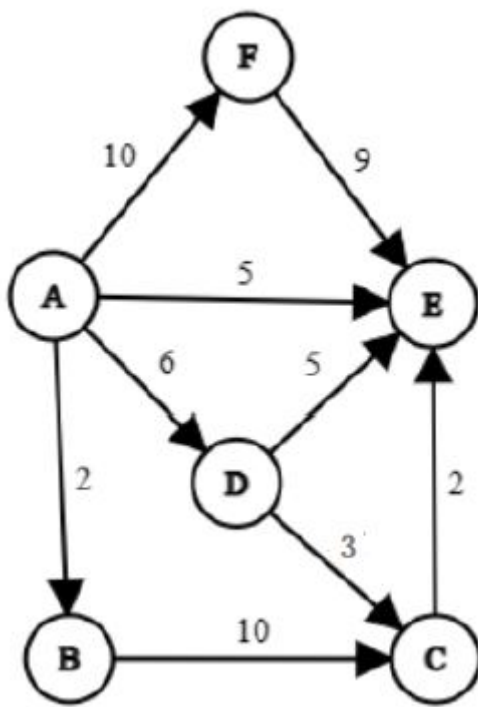
Question Number : 279 Question Id : 640653608943 Question Type : MCQ Is Question

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 graph



If Dijkstra algorithm is used with **A** as the source vertex then what is the order in which all other vertices are visited?

Options :

6406532034105. ✖ A, B, E, D, F, C

6406532034106. ✖ A, B, D, E, C, F

6406532034107. ✔ A, B, E, D, C, F

6406532034108. ✖ A, B, D, E, F, C

Question Number : 280 Question Id : 640653608945 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

The post-order traversal of a binary search tree with integer values produces the following sequence: 7, 5, 14, 12, 10, 20, 18, 25, 15. What is the value of the left child of the root of the tree?

Options :

6406532034113. ✖ 14

6406532034114. ✖ 12

6406532034115. ✔ 10

6406532034116. ✖ 7

6406532034117. ✖ 18

Question Number : 281 Question Id : 640653608947 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

If we do not maintain the height of subtrees at each node in an AVL tree, then what will be the upper bound of running time for inserting an element and balancing it if required?

Options :

6406532034119. ✖ $O(\log n)$

6406532034120. ✔ $O(n)$

6406532034121. ✖ $O(n \log n)$

6406532034122. ✖ $O(n^2)$

Question Number : 282 Question Id : 640653608951 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 recurrence relation for an algorithm:-

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

Base Case:- $T(1) = 1$

The complexity of this algorithm is__ .

Options :

6406532034130. ✖ $O(n)$

6406532034131. ✖ $O(\log^2 n)$

6406532034132. ✔ $O(n^2)$

6406532034133. ✖ $O(n^3)$

6406532034134. ✖ $O(n \log n)$

Question Number : 283 Question Id : 640653608952 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

In the Longest Common Subsequence problem we are given two sequences a_1, a_2, \dots, a_m and b_1, b_2, \dots, b_n . To get the length of Longest Common Subsequence at $LCS[m][n]$, the recursion formula is given as follows to fill matrix $LCS[i][j]$ where $0 \leq i \leq m$ and $0 \leq j \leq n$.

$$LCS[i, j] = \begin{cases} 0, & \text{if } i = 0 \text{ or } j = 0 \\ \text{Expression1}, & \text{if } a_i = b_j \\ \text{Expression2}, & \text{if } a_i \neq b_j \end{cases}$$

Which of the following represent the correct expression for *Expression1* and *Expression2*?

Options :

Expression1: $LCS[i - 1, j - 1]$

6406532034135. ✖

Expression2: $\max(LCS[i - 1, j], LCS[i, j - 1])$

Expression1: $1 + LCS[i - 1, j - 1]$

6406532034136. ✖

Expression2: $\min(LCS[i - 1, j], LCS[i, j - 1])$

Expression1: $1 + LCS[i - 1, j - 1]$

6406532034137. ✖

Expression2: $1 + \max(LCS[i - 1, j], LCS[i, j - 1])$

Expression1: $1 + LCS[i - 1, j - 1]$

6406532034138. ✔

Expression2: $\max(LCS[i - 1, j], LCS[i, j - 1])$

Question Number : 284 Question Id : 640653608954 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

Which of the following combinations of input text **T** and pattern **P** will exhibit the worst case running time behavior for the Boyer-Moore skipping heuristic?

Options :

6406532034140. ✖

T = 'baabaabaabaab' and **P** = 'abba'

6406532034141. ✔

T = 'aaaaaaaaaaaaa' and **P** = 'baaa'

6406532034142. ✖

T = 'aaaaaaaaaaaaa' and **P** = 'abbb'

6406532034143. ✖ T = 'aaaaaaaaaaaa' and P = 'bbba'

Question Number : 285 Question Id : 640653608955 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

The Knuth-Morris-Pratt (KMP) algorithm is used for efficient string matching. Given the pattern ababcabc .

Which of the following represents the correct fail function for the pattern?

Options :

6406532034144. ✖ [0, 0, 1, 2, 1, 1, 2, 3]

6406532034145. ✖ [0, 0, 1, 1, 2, 1, 2, 0]

6406532034146. ✔ [0, 0, 1, 2, 0, 1, 2, 0]

6406532034147. ✖ [0, 0, 1, 1, 1, 0, 1, 2]

Sub-Section Number :	5
Sub-Section Id :	64065387490
Question Shuffling Allowed :	Yes
Is Section Default? :	null

Question Number : 286 Question Id : 640653608939 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

Select the most appropriate data structure for the following applications.

Application	Data Structure
1. A sequence of food orders in a restaurant	a. Array
2. Matrix operations	b. Graph
3. Math expression evaluation with parentheses	c. Stack
4. Social media network	d. Queue

Options :

6406532034095. ✓ 1-d, 2-a, 3-c, 4-b

6406532034096. ✗ 1-d, 2-b, 3-c, 4-a

6406532034097. ✗ 1-d, 2-a, 3-d, 4-c

6406532034098. ✗ 1-a, 2-d, 3-c, 4-b

Question Number : 287 Question Id : 640653608959 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 α be an NP-Complete problem, β and γ be two other problems. β is polynomial time reducible to α and α is polynomial time reducible to γ .

On the basis of the above information, what can be inferred ?

Options :

6406532034151. ✗ β belongs to NP hard class

6406532034152. ✗ β belongs to NP complete class

6406532034153. ✓ γ belongs to NP hard class

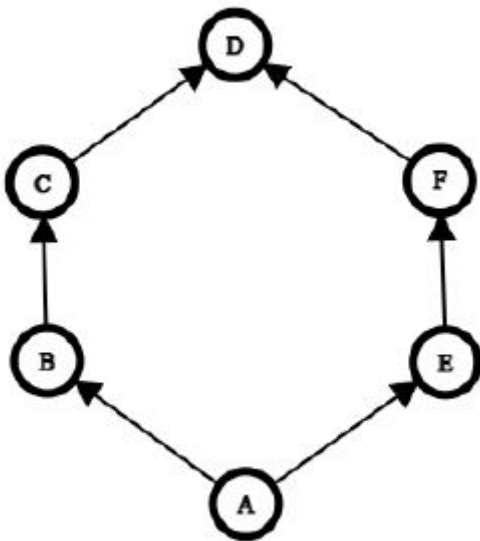
6406532034154. ✖ γ belongs to NP complete class

Sub-Section Number : 6
Sub-Section Id : 64065387491
Question Shuffling Allowed : Yes
Is Section Default? : null

Question Number : 288 **Question Id :** 640653608941 **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 DAG



How many possible topological orderings are there for the given DAG ?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

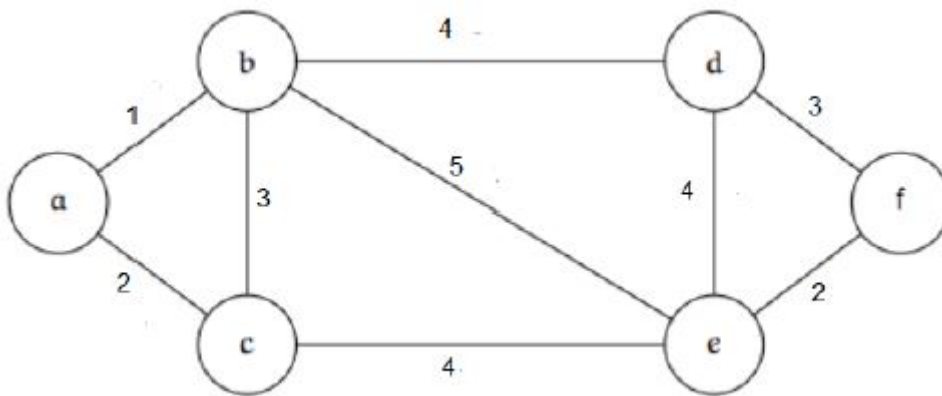
Question Number : 289 Question Id : 640653608942 Question Type : SA Calculator : None

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

Correct Marks : 4

Question Label : Short Answer Question

Consider the graph G given below.



The number of minimum cost spanning tree for the given graph is__.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

Question Number : 290 Question Id : 640653608946 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

In a binary tree T of 25 nodes, if the number of nodes with two children is 6, then the number of nodes with one child is ____

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

12

Question Number : 291 **Question Id :** 640653608949 **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 message **M** of 100 characters is composed by letters {a,b,c,d,e}. The probability of occurrence for each letter in message **M** is given below

Letter	a	b	c	d	e
Probability	0.18	0.39	0.07	0.26	0.10

If message **M** is encoded using Huffman coding, then the length of the encoded message in bits is ____ .

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

213

Question Number : 292 **Question Id :** 640653608950 **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 function MoM

```
1 def MoM(L): # Median of medians
2     if len(L) <= 5:
3         L.sort()
4         return(L[len(L)//2])
5     # Construct list of block medians
6     M = []
7     for i in range(0, len(L), 5):
8         X = L[i:i+5]
9         X.sort()
10        M.append(X[len(X)//2])
11    return(MoM(M))
```

What median value will be returned by the given MoM function for the following list?

```
1 [34, 67, 12, 5, 45, 88, 125, -3, 55, -22, 17, 66, 150, 71, 6, 9, -45, 200]
```

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

55

Question Number : 293 **Question Id :** 640653608953 **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 M_1, M_2, M_3, M_4 be 4 matrices of dimensions $10 \times 100, 100 \times 20, 20 \times 5, 5 \times 80$ respectively.

What is the minimum number of scalar multiplications required to multiply M_1, M_2, M_3, M_4 using basic matrix multiplication ?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

19000

Question Number : 294 **Question Id :** 640653608956 **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 17 in the text 7217837617?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

3

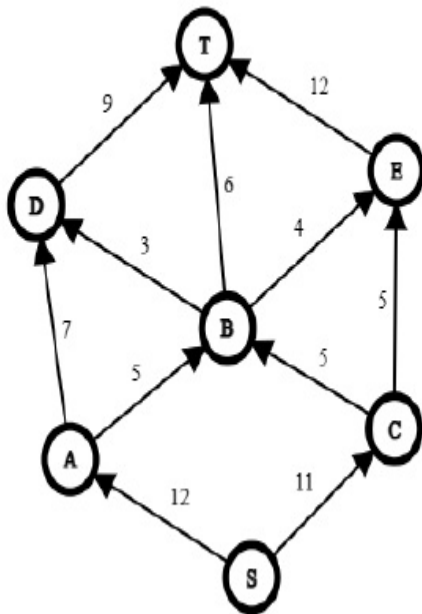
Question Number : 295 **Question Id :** 640653608957 **Question Type :** SA **Calculator :** None

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

Correct Marks : 4

Question Label : Short Answer Question

Consider the network given below 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 :

22

Sub-Section Number : 7

Sub-Section Id : 64065387492

Question Shuffling Allowed : Yes

Is Section Default? : null

Question Number : 296 **Question Id :** 640653608958 **Question Type :** SA **Calculator :** None

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

Correct Marks : 3

Question Label : Short Answer Question

Let G be a graph. The size of the minimum vertex cover of G is 12 and the size of the maximum independent set of G is 17. What are the number of the vertices in graph G ?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

29

DBMS

Section Id :	64065341240
Section Number :	12
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	20
Number of Questions to be attempted :	20
Section Marks :	50
Display Number Panel :	Yes
Section Negative Marks :	0
Group All Questions :	No
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	64065387493
Question Shuffling Allowed :	No
Is Section Default? :	null