AP PGECET QUESTION PAPER

2023



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Notations :

1.Options shown in green color and with ✔ icon are correct.

2.Options shown in red color and with ✖ icon are incorrect.

Question Paper Name :	Computer Science and Information Technology 28th May 2023 Shift 2
Duration :	120
Total Marks :	120
Display Marks:	No
Share Answer Key With Delivery Engine :	Yes
Calculator :	None
Magnifying Glass Required? :	No
Ruler Required? :	No
Eraser Required? :	No
Scratch Pad Required? :	No
Rough Sketch/Notepad Required? :	No
Protractor Required? :	No
Show Watermark on Console? :	Yes
Highlighter :	No
Auto Save on Console?	Yes
Change Font Color :	No
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Computer Science and Information Technology

Section Id :	78773219
Section Number :	1
Mandatory or Optional :	Mandatory
Number of Questions :	120
Section Marks :	120
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Maximum Instruction Time :	0
Is Section Default? :	null

Question Number : 1 Question Id : 7877322161 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Infer which of the following options, makes the expressions $p \implies q$ and $p \iff q$ to have different truth values.

Options :

1. ✖ $p = T, q = F$

2. ✖ $p = F, q = F$

3. ✖ $p = T, q = T$

4.

✔ p = F, q = T

Question Number : 2 Question Id : 7877322162 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

$(p \implies q) \wedge (q \implies r)$ is the antecedent of which of the following?

Options :

1. ✖ Modus Tollens

2. ✖ Modus Ponens

3. ✔ Hypothetical Syllogism

4. ✖ Conjunctive Syllogism

Question Number : 3 Question Id : 7877322163 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The number of possible functions from the set A = {1, 2} to the set B = {a, b, c} is

Options :

1. ✖ 6

2. ✖ 8

3. ✔ 9

4. ✖ 5

Question Number : 4 Question Id : 7877322164 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following truth table is similar to that of the expression $p \implies q$?

Options :

1. ✖ $q \implies p$

2. ✖ $\neg p \implies \neg q$

3. ✔ $\neg q \implies \neg p$

4. ✖ $(p \implies q) \wedge (q \implies p)$

Question Number : 5 Question Id : 7877322165 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Suppose this statement is true: "The garbage truck comes down my street if and only if it is Thursday morning." Which of the following statements could be true?
(a) It is noon on Thursday and the garbage truck did not come down my street this morning.
(b) It is Monday and the garbage truck is coming down my street.
(c) It is Wednesday at 11:59 PM and the garbage truck did not come down my street today.

Options :

1. ✖ Only (a)

2.

✔ Only (c)

3. ✖ Both (a) and (c)

4. ✖ Only (b)

Question Number : 6 Question Id : 7877322166 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

How many nonempty different collections can be formed from five identical pens and eight identical pencils?

Options :

1. ✔ 53

2. ✖ 54

3. ✖ 55

4. ✖ 56

Question Number : 7 Question Id : 7877322167 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

On the real line, place n white pegs at positions 1, 2, ... , n and n blue pegs at positions −1, −2, ... , −n (0 is open). Whites move only to the left, blues to the right. When beside an open position, a peg may move one unit to occupy that position (provided it is in the required direction). If a peg of one colour is in front of a peg of the other colour that is followed by an open position (in the required direction), a peg may jump two units to the open position (the jumped peg is not removed). By a sequence of these two types of moves (not necessarily alternating between white and blue pegs), one seeks to get the positions of the white and blue pegs interchanged. How many moves (unit steps and jumps) are required to complete the game?

Options :

1. ✖ n^2

2. ✖ $n^2 + n$

3. ✖ $2n$

4. ✔ $n^2 + 2n$

Question Number : 8 Question Id : 7877322168 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A committee of k people is to be chosen from a set of seven women and four men. How many ways are there to form the committee if the committee has four people and at least two are women?

Options :

1. ✖ 300

2. ✔ 301

3. ✖ 302

4. ✖ 303

Question Number : 9 Question Id : 7877322169 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

We consider a way of measuring the influence of different players in weighted voting. Suppose that in a 5-person regional council there are three representatives from small towns, call them a, b, c, who each cast one vote, and there are two representatives from large towns, call them D, E, who each cast two votes. With a total of seven votes cast, it takes four votes (a majority of votes) in favour of legislation to enact it. Suppose that in forming a coalition to vote for some legislation, the people join the coalition in order (an arrangement of the people). The pivotal person in a coalition arrangement is the person whose vote brings the number of votes in the coalition up to four. For example, in the coalition arrangement bDcaE, the pivotal person is c. A measure of the "power" of a person p in the council is the fraction of coalition arrangements in which p is the pivotal person. This measure of power is called the Shapley–Shubik index. Determine the Shapley–Shubik index of person a in this council.

Options :

1. ✖ 1/30

2. ✖ 2/30

3. ✖ 3/30

4.

✔ 4/30

Question Number : 10 Question Id : 7877322170 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

How many ways are there to pick a collection of exactly 10 balls from a pile of red balls, blue balls, and purple balls if there must be at most five red balls?

Options :

1. ✖ 21

2. ✖ 22

3. ✔ 51

4. ✖ 52

Question Number : 11 Question Id : 7877322171 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Consider binary numbers with eight bits out of which there are two 0's and six 1's. How many such distinct binary numbers are there?

Options :

1. ✔ 28

2. ✖ 30

3. ✖ 32

4. ✖ 34

Question Number : 12 Question Id : 7877322172 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Now suppose the graph in the Figure represents a section of a city's street map. We want to position surveillance cameras at corners (vertices) so that they can keep every block (edge) under surveillance—that is, every edge should have cameras at (at least) one of its end vertices. What is the smallest number of cameras required to do this job?

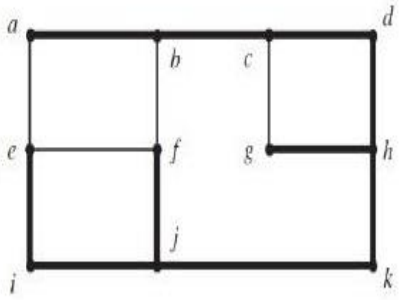


Fig. Map of a section of the City

Options :

1. ✖ 4

2. ✔ 5

3. ✖ 6

4. ✖ 7

Question Number : 13 Question Id : 7877322173 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Consider the following scheduling problem. A state legislature has many committees that meet for one hour each week. One wants a schedule of committee meeting times that minimizes the total number of hours of meetings—but such that two committees with overlapping membership cannot meet at the same time. Which of the following statements is true regarding the typical and the most straightforward way to model this problem?

Options :

1. ✖ The problem can be modelled as a Vertex cover finding problem.

2. ✖ The problem can be modelled as a shortest path finding problem.

3. ✔ The problem can be modelled as the Independent Set finding problem.

4. ✖ The problem can be modelled as a spanning tree finding problem.

Question Number : 14 Question Id : 7877322174 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Suppose x and y are the only two vertices of odd degree in graph G, and x and y are not adjacent to each other. Consider the following statements:

(a) G is connected.

(b) the graph obtained from G by adding edge (x, y) is connected.

Which of the following statements is the most appropriate and meaningful description of the relationship between the statements (a) and (b)?

Options :

1. ✖ (a) and (b) are not related

2. ✔ $a \Leftrightarrow b$

3. ✖ $a \wedge b$ is a contradiction

4. ✖ $a \wedge b$ is a tautology

Question Number : 15 Question Id : 7877322175 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following statements is true about non-planar graphs? Fig (a) and (b) depict $K_{3,3}$ and K_5 respectively which are referred in the options for this question.

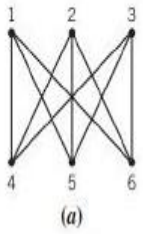


Fig. a. $K_{3,3}$

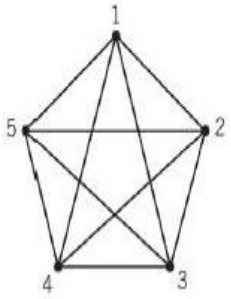


Fig. b. K_5

Options :

1. ✖ Any non-planar graph always contains a $K_{3,3}$

2. ✖ Any non-planar graph always contains a K_5

3. ✖ Any non-planar graph always contains both a $K_{3,3}$ and a K_5

4. ✔ Any non-planar graph always contains a $K_{3,3}$ or a K_5

Question Number : 16 Question Id : 7877322176 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

How many regions are there in any plane graph depiction of G, if G is a connected planar graph? Let v and e denote the number of vertices and edges, respectively, in G.

Options :

1. ✖ e - v + 1

2. ✔ e - v + 2

3. ✖ e - v + 3

4. ✖ e - v

Question Number : 17 Question Id : 7877322177 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

How many regions would there be in a plane graph with 10 vertices each of degree 3?

Options :

1. ✖ 5

2. ✖ 6

3. ✔ 7

4. ✖ 8

Question Number : 18 Question Id : 7877322178 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

If G is a connected planar graph with 5 vertices then what is a tight upper bound on the number of edges in G?

Options :

1. ✖ 5

2. ✔ 9

3. ✖ 12

4. ✖ 15

Question Number : 19 Question Id : 7877322179 Display Question Number : Yes Is Question

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

Which of the following statements is true regarding multigraphs?

Options :

1. ✔ A multigraph has an Euler cycle if and only if it is connected and has all vertices of even degree.

2. ✖ A multigraph has an Euler cycle if and only if it is connected and has all vertices of odd degree.

3. ✖ A multigraph cannot have an Euler cycle.

4. ✖ A multigraph has an Euler cycle if and only if it is not connected and has all vertices of even degree.

Question Number : 20 Question Id : 7877322180 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A graph with n vertices, $n > 2$, has a Hamilton circuit if the degree of each vertex is at least _____. Select the tightest bound possible.

Options :

1. ✖ n

2. ✔ n/2

3. ✖ n-1

4. ✖ n-2

Question Number : 21 Question Id : 7877322181 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

In a round-robin tournament, each of the n contestants plays every other contestant once. A schedule for a round-robin tournament specifies which games are played each day. We assume that no contestant plays more than one game a day. Model the problem of scheduling games in a round-robin tournament as an edge coloring problem. What is a minimal (fewest days) schedule for a tournament with four contestants?

Options :

1. ✖ 2 days

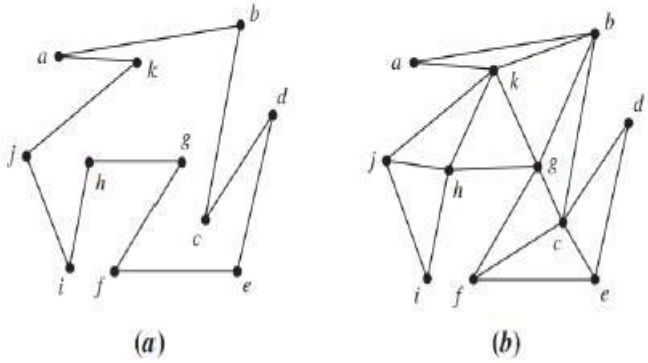
2. ✔ 3 days

3. ✖ 4 days

4. ✖ 5 days

Question Number : 22 Question Id : 7877322182 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

By a triangulation of a polygon, we mean the process of adding a set of straight-line chords between pairs of vertices of a polygon so that all interior regions of the graph are bounded by a triangle (these chords cannot cross each other nor can they cross the sides of the polygon). Figure b shows one possible triangulation of the polygon in Figure a.



Which of the following is the correct tightest bound on the chromatic number of the vertices in a triangulation of a polygon?

Options :

1. ✖ The vertices in a triangulation of a polygon can be 2-colored.

2. ✔ The vertices in a triangulation of a polygon can be 3-colored.

3. ✖ The vertices in a triangulation of a polygon can be 4-colored.

4. ✖ The vertices in a triangulation of a polygon can be 5-colored.

Question Number : 23 Question Id : 7877322183 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

If the maximum degree of a vertex in a graph G is d, then which of the following is the edge chromatic number of G?

Options :

1. ✔ either d or d + 1.

2. ✖ either d – 1 or d.

3. ✖ either d – 2 or d.

4. ✖ either d – 3 or d.

Question Number : 24 Question Id : 7877322184 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following statements is true and represents the tightest bound on the chromatic number regarding planar graphs?

Options :

1. ✖ Every planar graph can be 3-colored.

2. ✔ Every planar graph can be 5-colored.

3. ✖ Every planar graph can be 7-colored.

4. ✖ Every planar graph can be 9-colored.

Question Number : 25 Question Id : 7877322185 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What is the number of edges in a Spanning tree of a connected graph with n vertices?

Options :

1. ✖ n

2. ✔ n-1

3. ✖ n-2

4. ✖ n+1

Question Number : 26 Question Id : 7877322186 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What is the largest number that can be represented using N bits?

Options :

1. ✖ 2^N

2. ✔ $2^N - 1$

3. ✖ $2^N + 1$

4. ✖ 2^{N-1}

Question Number : 27 Question Id : 7877322187 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following is the Gray code of the decimal number 15?

Options :

1. ✔ 1000

2. ✖ 1111

3. ✖ 1001

4. ✖ 1110

Question Number : 28 Question Id : 7877322188 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

How many bytes are needed to represent the decimal value 123456 in BCD?

Options :

1. ✖ 2 bytes

2. ✔ 3 bytes

3. ✖ 4 bytes

4. ✖ 5 bytes

Question Number : 29 Question Id : 7877322189 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following is the simplified form of the following Boolean expression?

$$(C + D)(\bar{C} + D)$$

Options :

1. ✖ C

2. ✔ D

3. ✖ $\bar{C}$

4. ✖ $\bar{D}$

Question Number : 30 Question Id : 7877322190 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following is a K-map simplified equivalent of the following Boolean expression?

$$\bar{C}(\bar{A}\bar{B}\bar{D} + D) + A\bar{B}C + \bar{D}$$

Options :

1. ✖ AB

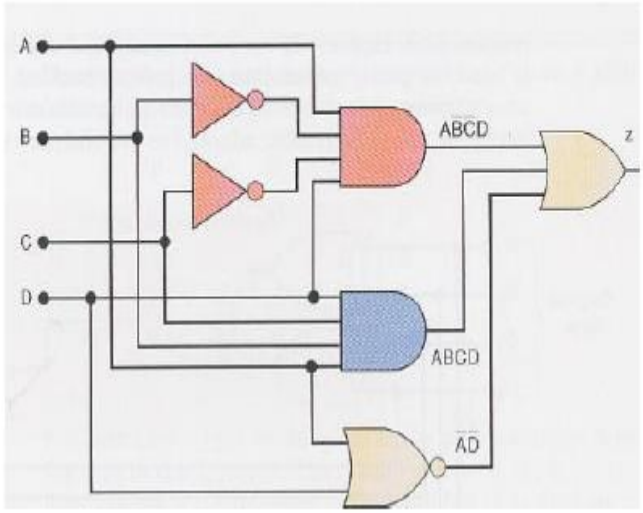
2. ✖ $A\bar{B} + CD$

3. ✖ $A\bar{B} + C$

4. ✔ $A\bar{B} + \bar{C} + \bar{D}$

Question Number : 31 Question Id : 7877322191 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

How many gates are required to realize the following circuit for z, if XNOR gate is used to simplify the circuit?



Options :

1. ✖ 5

2. ✔ 4

3. ✖ 3

4. ✖ 2

Question Number : 32 Question Id : 7877322192 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

How many additional gates are required to convert an XOR gate into a NOT gate?

Options :

1. ✔ 0

2. ✖ 1

3. ✖ 2

4. ✖ 3

Question Number : 33 Question Id : 7877322193 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

In SR Flip-flops the indeterminate state corresponds to which of the following inputs?

Options :

1. ✖ S=0, R=0

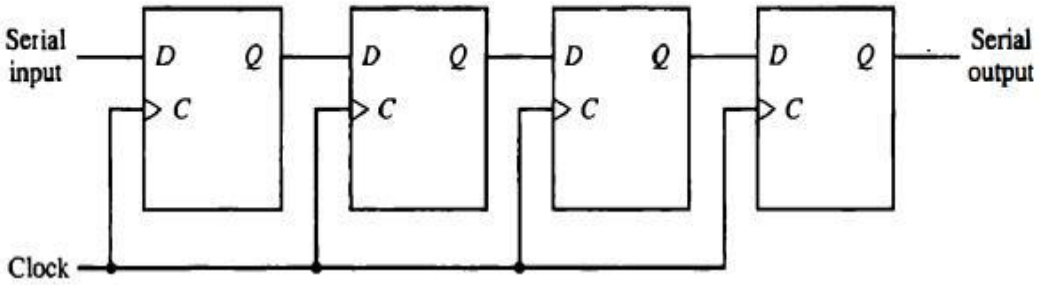
2. ✖ S=0, R=1

3. ✖ S=1, R=0

4. ✔ S=1, R=1

Question Number : 34 Question Id : 7877322194 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following describes the circuit shown below?



Options :

1. ✖ 4-bit parallel adder

2. ✔ 4-bit shift register

3. ✖ 4-bit synchronous binary counter

4. ✖ 4-bit serial adder

Question Number : 35 Question Id : 7877322195 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the phases are implied by the following sequence of microoperations?

$AR \leftarrow PC$
$IR \leftarrow M[AR], \quad PC \leftarrow PC + 1$

Options :

1. ✔ Only Fetch

2. ✖ Only Fetch and Decode

3. ✖ Only Fetch, Decode, and Execute

4. ✖ Fetch, Decode, Execute and Write

Question Number : 36 Question Id : 7877322196 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What is the clock rate of a processor having a clock period of 0.8 nanoseconds?

Options :

1. ✖ 1.25 KHz

2. ✖ 1.25 MHz

3. ✖ 125 Million cycles per second

4. ✔ 1250 Million cycles per second

Question Number : 37 Question Id : 7877322197 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

In which of the following addressing modes, the effective address of the operand is generated by adding a constant value to the contents of a register?

Options :

1. ✖ Indirect mode

2. ✔ Index mode

3. ✖ Register mode

4. ✖ Immediate mode

Question Number : 38 Question Id : 7877322198 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Assume that Cache has 128 blocks. Block i of the main memory maps onto the block i mod 128 of the cache memory. Which of the following mapping technique is implied here?

Options :

1. ✔ Direct mapping

2. ✖ Associative mapping

3. ✖ Set Associative mapping

4. ✖ Block Associative mapping

Question Number : 39 Question Id : 7877322199 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following denotes a tight bound on the time complexity of converting an array with 'n' integers into a Binary Max heap?

Options :

1. ✖

$O(\log_2 n)$

2. ✔ $O(n)$

3. ✖ $O(n \log_2 n)$

4. ✖ $O(n^2)$

Question Number : 40 Question Id : 7877322200 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following statements is / are true?

a) Big Omega (Ω) notation is used for denoting only asymptotically tight bounds.

b) Small Omega (ω) notation is used for denoting only asymptotically non-tight bounds.

Options :

1. ✖ Only a)

2. ✔ Only b)

3. ✖ Neither a) nor b)

4. ✖ Both a) and b)

Question Number : 41 Question Id : 7877322201 Display Question Number : Yes Is Question

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

Which of the following is true regarding f(n) = O(g(n))?

Options :

1. ✖ f(n) is equal to O(g(n)).

2. ✔ f(n) is a member of the set O(g(n)).

3. ✖ f(n) is not equal to g(n).

4. ✖ f(n) is upper bounded by cg(n) for all $n \geq 0$, for some positive constant c.

Question Number : 42 Question Id : 7877322202 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What is the asymptotic relationship between the functions $f(n) = n$ and $g(n) = n^{1+\sin n}$?

Options :

1. ✖ f(n) is upper bounded by g(n).

2. ✖ f(n) is lower bounded by g(n).

3. ✖ f(n) is both upper and lower bounded by g(n).

4. ✔ f(n) and g(n) are not asymptotically relatable.

Question Number : 43 Question Id : 7877322203 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following heuristic yields an optimal solution while solving the fractional knapsack problem?

Options :

1. ✖ picking objects in the non-increasing order of their values.

2. ✖ picking objects in their non-decreasing order of their weights.

3. ✖ picking objects in a random order.

4. ✔ picking objects in the non-increasing order of their value per unit weight.

Question Number : 44 Question Id : 7877322204 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following data structures is suitable for implementing Kruskal's Minimum Spanning Tree finding algorithm efficiently?

Options :

1. ✖ Trees.

2. ✖ Priority queues.

3. ✔ Disjoint sets.

4. ✖ Heaps.

Question Number : 45 Question Id : 7877322205 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following problems does not have the optimal substructure property?

Options :

1. ✖ 0/1 Knapsack.

2. ✖ Chained matrix multiplication.

3. ✖ Finding longest common subsequence between two strings.

4. ✔ Finding the longest path in a weighted, connected graph.

Question Number : 46 Question Id : 7877322206 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following recursion arises while computing the number of ways of computing the product of a sequence of matrices $M_1 \times M_2 \times \ldots \times M_n$?

Options :

1. ✖ Fibonacci recursion.

2. ✖ Ackermann recursion.

3. ✔ Catalan recursion.

4. ✖ Tail recursion.

Question Number : 47 Question Id : 7877322207 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following statement is true for solving the recursion $T(n) = T(\sqrt{n}) + 1$?

Options :

1. ✖ Solution for the recurrence is $\theta(1)$.

2. ✖ Solution for the recurrence is $\theta(\log_2 n)$.

3. ✔ Solution for the recurrence is $\theta(\log_2 \log_2 n)$.

4. ✖ Solution for the recurrence is $\theta(\sqrt{n})$.

Question Number : 48 Question Id : 7877322208 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following statements is true regarding a stack containing n elements?

Options :

1. ✖ Push and pop operations consume O(n) time when implementing stacks using Linked lists.

2. ✔ Stacks are implicitly used while running recursive algorithms.

3. ✖ Stacks are not useful while parsing programs.

4. ✖ Stacks cannot be treated as a dynamic data structure.

Question Number : 49 Question Id : 7877322209 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What is the tightest bound on the time complexity to search for an element in an ordered singly linked list containing n elements?

Options :

1. ✖ $O(\log_2 n)$

2. ✔ $O(n)$

3. ✖ $O(1)$

4. ✖ $O(n^2)$

Question Number : 50 Question Id : 7877322210 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What is the theoretical lower bound on the time complexity of any comparison-based sorting algorithm to sort an array of 'n' integers?

Options :

1. ✖ $\Omega(n)$

2. ✔ $\Omega(nlog_2n)$

3. ✖ $\Omega(n^2)$

4. ✖ $\Omega(n^2 \log_2 n)$

Question Number : 51 Question Id : 7877322211 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following statements is true about insertion sort?

Options :

1. ✖ The best-case running time of insertion sort is $\theta(n^2)$.

2. ✖ The worst-case running time of insertion sort is $\theta(nlog_2n)$

3. ✔ It is suitable to be run on an array that is nearly sorted.

4. ✖ It is suitable to be run on an array that is reverse sorted.

Question Number : 52 Question Id : 7877322212 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Select the best option with which to fill in the blank below:

If quadratic probing is used, and the table size 'm' is prime, then a new element can always be inserted if the number of free slots in the table is at least _____.

Options :

1. ✖ m/5

2. ✖ m/4

3. ✖ m/3

4. ✔ m/2

Question Number : 53 Question Id : 7877322213 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What is the expected number of probes required for insertions and unsuccessful searches in a hash table that uses linear probing, assuming that the hash table has a load factor of n?

Options :

1. ✔ $\frac{1}{2}\left(1+\frac{1}{(1-n)^2}\right)$

2. ✖ $\frac{2}{n^2}$

3. ✖ $\frac{1}{n}$

4. ✖ $\frac{1}{2}\left(1+\frac{1}{(1-n)}\right)$

Question Number : 54 Question Id : 7877322214 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

For the perfect binary tree of height h containing $2^{\{h+1\}} - 1$ nodes, which of the following is the sum of the heights of the nodes?

Options :

1. ✖ $2^h - (h + 1)$

2. ✔ $2^{\{h+1\}} - 1 - (h + 1)$

3. ✖ $2^{\{h+1\}} - 1$

4. ✖ $2^{\{h+1\}} + 1$

Question Number : 55 Question Id : 7877322215 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following is a lower bound on the time complexity of the following recursive algorithm?

```
int findBC(int n, int k)
{
   // Assume n >= k
   if(n == k or k == 0) return 1;
   else return findBC(n-1, k-1) + findBC(n-1, k);
}
```

Options :

1. ✖ $\Omega(nk)$

2. ✖ $\Omega(n+k)$

3. ✖ $\Omega(\max(n,k))$

4. ✔ $\Omega(nC_k)$ or $\Omega\binom{n}{k}$

Question Number : 56 Question Id : 7877322216 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following is equal to the asymptotic expression $o(g(n)) \cap \omega(g(n))$ for some asymptotic non-negative function $g(n)$?

Options :

1. ✖ $g(n)$

2. ✖ $o(g(n))$

3. ✖ $\omega(g(n))$

4. ✔ ϕ

Question Number : 57 Question Id : 7877322217 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction

Time : 0

Which of the following is the tightest lower bound on the time complexity of the brute force algorithm to solve the Travelling Salesperson Problem (TSP) on a completely connected graph with n vertices and the source vertex as inputs?

Options :

1. ✔ $\Omega(n!)$

2. ✖ $\Omega((n-1)!)$

3. ✖ $\Omega(nn!)$

4. ✖ $\Omega(2^n)$

Question Number : 58 Question Id : 7877322218 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following represents a correct upper bound on the space complexity of the optimal algorithm for finding nC_k using dynamic programming? Assume n > k.

Options :

1. ✖ $O(nk)$

2. ✖ $O(n)$

3. ✔ $O(k)$

4. ✖ $O(1)$

Question Number : 59 Question Id : 7877322219 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The term NP in the NP-hardness theory refers to which of the following?

Options :

1. ✖ Non-Polynomial.

2. ✖ Non-Probabilistic.

3. ✔ Non deterministic Polynomial.

4. ✖ Non deterministic non-Polynomial.

Question Number : 60 Question Id : 7877322220 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Optimization Problems :: Decision Problems has the same relationship as that of which of the following direction-specific mappings?

Options :

1. ✖ NP-Complete :: NP-Hard

2. ✖ NP :: P

3. ✖ P :: NP

4. ✔ NP-Hard :: NP-Complete

Question Number : 61 Question Id : 7877322221 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following is the relationship between the problems HAM and HAMD?

HAM: finding Hamiltonian circuit in a graph.

HAMD: deciding whether there is a Hamiltonian circuit in a graph.

Options :

1. ✔ $HAM \equiv_T^P HAMD$

2. ✖ $HAM \leq_T^P HAMD$ is true but $HAMD \leq_T^P HAM$ is not true.

3. ✖ $HAMD \leq_T^P HAM$ is true but $HAM \leq_T^P HAMD$ is not true.

4. ✖ $HAMD \leq_T^P HAM$ and $HAM \leq_T^P HAMD$ are both false.

Question Number : 62 Question Id : 7877322222 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Let X be an NP-Complete problem. Consider a decision problem Y such that Y is in NP and $X \leq_T^P Y$. Which of the following can be inferred about the complexity class of Y?

Options :

1. ✖ NP-Hard

2. ✔ NP-Complete

3. ✖ Not NP-Hard

4. ✖ Not NP-Complete

Question Number : 63 Question Id : 7877322223 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following is the correct $\epsilon - closure(1)$ in the following NFA?

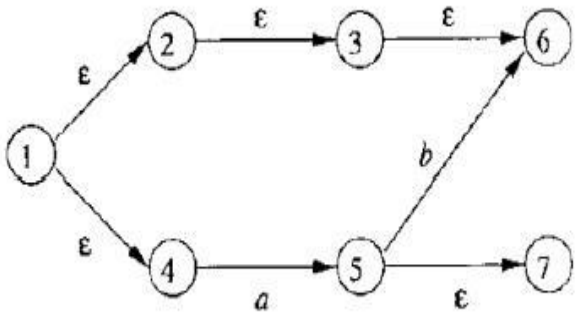


Fig. NFA

Options :

1. ✖ $\{1, 2, 3, 4, 5, 6\}$

2. ✔ $\{1, 2, 3, 4, 6\}$

3. ✖ $\{2, 4\}$

4. ✖ $\{2, 4, 3, 6\}$

Question Number : 64 Question Id : 7877322224 Display Question Number : Yes Is Question

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

If R is a regular expression, then the result of concatenating R with Φ that is, RΦ is equal to which of the following?

Options :

1. ✖ R

2. ✖ R^*

3. ✖ R^+

4. ✔ Φ

Question Number : 65 Question Id : 7877322225 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following regular expressions correspond to the automaton below?

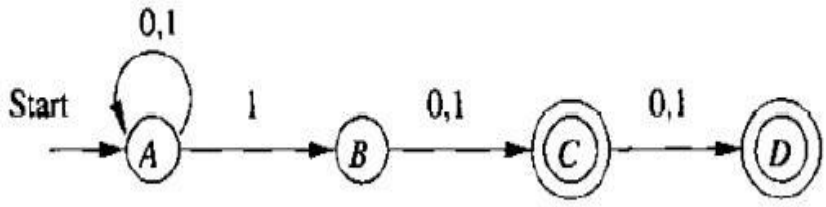


Fig. Automaton

Options :

1. ✖ $(0+1)^*1(0+1)$

2. ✖ $(0+1)^*1(0+1)(0+1)$

3. ✔ $(0+1)^*1(0+1)+(0+1)^*1(0+1)(0+1)$

4. ✖ $(0+1)^*1(0+1)^*$

Question Number : 66 Question Id : 7877322226 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A: Regular languages are closed under homomorphisms.

B: Regular languages are closed under inverse homomorphisms.

Which of the following statements is true regarding the statements A and B?

Options :

1. ✖ Both A and B are false.

2. ✖ A is true but B is false.

3. ✖ B is true but A is false.

4. ✔ Both A and B are true.

Question Number : 67 Question Id : 7877322227 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following states are equivalent in the automaton below?

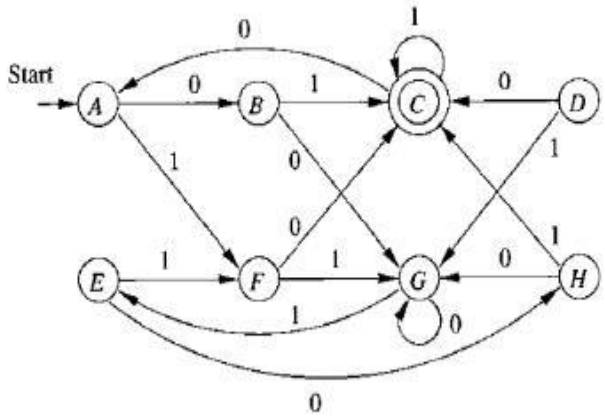


Fig. Automaton

Options :

1. ✖ C, G

2. ✖ A, G

3. ✔ A, E

4. ✖ E, F

Question Number : 68 Question Id : 7877322228 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the statements below is true regarding the following language?

$$L = \{a^n b^n c^m d^m \mid n \geq 1, m \geq 1\} \cup \{a^n b^m c^m d^n \mid n \geq 1, m \geq 1\}$$

Options :

1. ✔ There exists an ambiguous context free grammar for L.

2. ✖ There exists an unambiguous context free grammar for L.

3. ✖ L is not inherently ambiguous.

4. ✖ Whether L is inherently ambiguous or not cannot be decided based on the information provided.

Question Number : 69 Question Id : 7877322229 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following statements is true regarding the following language?

$$L = \{0^n 1^n \mid n \geq 1\} \cup \{0^n 1^{2n} \mid n \geq 1\}$$

Options :

1. ✖ L is not Context free.

2. ✖ L is context free and can be accepted by a Deterministic Pushdown Automaton.

3. ✔ L is context free and cannot be recognized by any Deterministic Pushdown Automaton.

4. ✖ L is context sensitive.

Question Number : 70 Question Id : 7877322230 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following statements is true regarding the languages given below?

$$L_1 = \{x^i y^j z^k | i < j < k \text{ and } i, j, k \geq 0\}$$

$$L_2 = \{0^p | p \text{ is a prime}\}$$

Options :

1. ✖ Both L_1 and L_2 are context free.

2. ✔ Both L_1 and L_2 are not context free.

3. ✖ L_1 is context free but L_2 is not context free.

4. ✖ L_1 is not context free but L_2 is context free.

Question Number : 71 Question Id : 7877322231 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

For any grammar that is in Chomsky Normal Form (CNF), how many internal nodes will be there in parse trees for strings of length n (after parsing the string using the CNF grammar)?

Options :

1. ✖ 2n

2. ✔ 2n-1

3. ✖ 2n-2

4. ✖ 2n+1

Question Number : 72 Question Id : 7877322232 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following language is accepted by the Turing Machine given in the figure below? B denotes the blank symbol, 0, 1 are the input symbols, X, Y are the output symbols and the arrows in the transition labels indicate the direction in which the read/write head moves.

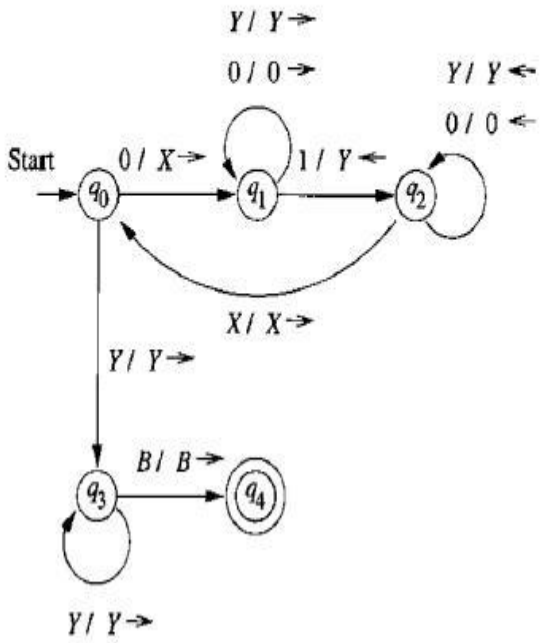


Fig. Turing Machine

Options :

1. ✔ $\{0^i 1^j | i, j \geq 1 \text{ and } i = j\}$

2. ✖ $\{0^i 1^j | i, j \geq 1 \text{ and } i \geq j\}$

3. ✖ $\{0^i 1^j | i, j \geq 1 \text{ and } i \leq j\}$

4. ✖ $\{0^i 1^j | i, j \geq 1 \text{ and } j = 2i\}$

Question Number : 73 Question Id : 7877322233 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following statements is false?

Options :

1. ✖ If L is a recursive language so is $\bar{L}$.

2. ✖ Recursive languages are a subset of recursively enumerable languages.

3. ✖ If both the language L and $\bar{L}$ are recursively enumerable then L is recursive.

4. ✔ If both the language L and $\bar{L}$ are recursively enumerable then $\bar{L}$ is not recursive.

Question Number : 74 Question Id : 7877322234 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following statements is decidable?

Options :

1. ✖ Whether the language accepted by a Turing Machine is empty.

2. ✖ Whether the language accepted by a Turing Machine is finite.

3. ✖ Whether the language accepted by a Turing Machine is a context-free language.

4. ✔ Whether there exists some input such that the Turing Machine makes at least 10 moves.

Question Number : 75 Question Id : 7877322235 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the action given below is performed by the following Syntax Directed Translator (SDT)?

PRODUCTION	SEMANTIC RULE
$expr \rightarrow expr_1 + term$	$expr.t := expr_1.t \parallel term.t \parallel '+'$
$expr \rightarrow expr_1 - term$	$expr.t := expr_1.t \parallel term.t \parallel '-'$
$expr \rightarrow term$	$expr.t := term.t$
$term \rightarrow 0$	$term.t := '0'$
$term \rightarrow 1$	$term.t := '1'$
. . .	. . .
$term \rightarrow 9$	$term.t := '9'$

Options :

1. ✖ Expression evaluation.

2. ✖ Infix to Prefix conversion.

3. ✔ Infix to Postfix conversion.

4. ✖ Verification of the syntax of the expression.

Question Number : 76 Question Id : 7877322236 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Let lcs(x,y) be the longest common subsequence between any two strings x and y. For example, "tie" is a longest common subsequence of "striped" and "tiger". Let d(x,y) be the minimum number of insertions and deletions required to transform x into y. Which of the following is true regarding d(x,y)? For any string z, |z| denotes the length of the string in the following options.

Options :

1. ✔ $d(x,y) = |x| + |y| -(2*|lcs(x,y)|)$

2. ✖ $d(x,y) = |x| + |y| -|lcs(x,y)|$

3. ✖ $d(x,y) = |x| + |y|$ - number of not-common characters between x and y.

4. ✖ An expression cannot be inferred with the given information.

Question Number : 77 Question Id : 7877322237 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Consider the following grammar in which E is the start symbol.

$$E \rightarrow TE'$$
$$E' \rightarrow +TE' \mid \epsilon$$
$$T \rightarrow FT'$$
$$T' \rightarrow * FT' \mid \epsilon$$
$$F \rightarrow (E) \mid \mathbf{id}$$

Which symbols are in the Follow set of T?

Options :

1. ✖ {(, id}

2. ✖ {+, ϵ}

3. ✗ {+, *,), $}

4. ✓ {+,), $}

Question Number : 78 Question Id : 7877322238 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

In the LL(1) parsing table T of the following grammar, which slot has multiple entries?

$$S \rightarrow iEtSS' \mid a$$
$$S' \rightarrow eS \mid \in$$
$$E \rightarrow b$$

S is the start symbol of this grammar; Lower-case letters are terminals and upper-case letters are non-terminals.

Options :

1. ✗ T[S, a]

2. ✗ T[S, i]

3. ✓ T[S', e]

4. ✗ T[E, b]

Question Number : 79 Question Id : 7877322239 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Consider the following grammar in which S is the start symbol.

S → *a*ABe
A → Abc | b
B → d

Lower-case letters are terminals and upper-case letters are non-terminals.

What is the first handle while parsing the sentence "abbcde" using a bottom-up parser?

Options :

1. ✔ b at position 2.

2. ✖ d at position 5.

3. ✖ b at position 3.

4. ✖ handle does not exist for the given string.

Question Number : 80 Question Id : 7877322240 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Consider the following operator grammar:

$$E \rightarrow E+E \mid E-E \mid E*E \mid E/E \mid E \uparrow E \mid (E) \mid -E \mid \mathbf{id}$$

Which of the following entry is an empty slot in the operator precedence table T?

Options :

1. ✔ T[id, (]

2. ✖ T[(,)]

3. ✖ T[id, +]

4. ✖ T[+, *]

Question Number : 81 Question Id : 7877322241 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Consider a LR parsing table in which the slot corresponding to action[s, a] contains the entry "reduce $A \rightarrow \beta$" where s is a state, a is a terminal symbol and $\beta \in (N \cup T)^*$. N is the set of non-terminals and T is the set of terminals. How many symbols will be popped off the parser stack when the parser is in the state 's' and reads the symbol 'a' in the input buffer?

Options :

1. ✖ β

2. ✖ $\beta/2$

3. ✔ 2β

4. ✖ *one symbol*

Question Number : 82 Question Id : 7877322242 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Consider the following augmented expression grammar with the start symbol E'.

$E' \rightarrow E$

$E \rightarrow E + T \mid T$

$T \rightarrow T * F \mid F$

$F \rightarrow (E) \mid \text{id}$

If I is the set of one LR(0) item $\{[E' \rightarrow .E]\}$, then how many LR(0) items will be there in $closure(I)$?

Options :

1. ✖ 1

2. ✖ 3

3. ✖ 5

4. ✔ 7

Question Number : 83 Question Id : 7877322243 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Consider the following augmented grammar with S' as the start symbol.

$S' \rightarrow S$
$S \rightarrow CC$
$C \rightarrow cC \mid d$

In the grammar, lower-case letters are terminals and upper-case letters are non-terminals. How many states will be there in the Canonical parsing table of this augmented grammar?

Options :

1. ✖ 8

2. ✖ 9

3. ✔ 10

4. ✖ 11

Question Number : 84 Question Id : 7877322244 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following statements is true regarding parser generators?

Options :

1. ✖ Ambiguous grammars cannot be used with YACC.

2. ✖ The associativity of operators cannot be specified using declarations in YACC.

3. ✖ There is no provision for error recovery in YACC.

4. ✔ An operator can be declared as a non-associative binary operator in YACC.

Question Number : 85 Question Id : 7877322245 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What is the output of the following code if dynamic scoping is used by the runtime environment?

```
(1) program dynamic(input,output);
(2)    var r : real;
(3)    procedure show;
(4)       begin write( r : 5:3 ) end;
(5)    procedure small;
(6)       var r : real;
(7)       begin r := 0.125; show end;
(8)    begin
(9)       r := 0.25;
(10)      show; small; writeln;
(11)      show; small; writeln
(12)   end.
```

Options :

1. ✗
```
0.250 0.250
0.250 0.250
```

2. ✓
```
0.250 0.125
0.250 0.125
```

3. ✗
```
0.125 0.125
0.125 0.125
```

4. ✗
```
0.250 0.250
0.125 0.125
```

Question Number : 86 Question Id : 7877322246 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

If all the operators being parsed are binary, then a string of operators and operands constitute a postfix expression if and only if:

(a) There is exactly one fewer operator than operands.

(b) Every non-empty prefix of the expression has fewer operators than operands.

Which of the above two condition(s) is/are true for the string to be a postfix expression?

Options :

1. ✖ Only (a).

2. ✖ Only (b)

3. ✔ Both (a) and (b)

4. ✖ Neither (a) nor (b)

Question Number : 87 Question Id : 7877322247 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Consider a machine having two registers R0, R1 and the following instructions each of unit cost:

```
Ri := Mj
Ri := Ri op Rj
Ri := Ri op Mj
Ri := Rj
Mi := Ri
```

In these instructions, Ri and Rj are either R0 or R1 and Mj is a memory location, op is an operation supported by the machine. Assume that the dynamic programming-based code generation algorithm by Aho and Johnson is used for generating optimal code. What is the cost vector associated with the root node of the syntax tree for the high-level language expression (a-b)+c*(d/e)?

Options :

1. ✖ (0,1,1)

2. ✖ (5,5,4)

3. ✖ (3,2,2)

4. ✔ (8,8,7)

Question Number : 88 Question Id : 7877322248 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Consider the following intermediate code-tree for the high-level language statement a[i] := b+1

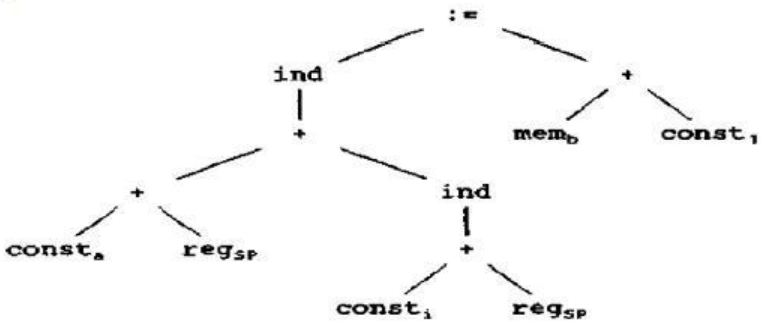


Fig. Intermediate Code Tree

What is the number of instructions generated if the following tree rewriting rules are applied to the intermediate code-tree shown above?

(1)	$reg_i \leftarrow const_c$	{ MOV #c, Ri }
(2)	$reg_i \leftarrow mem_a$	{ MOV a, Ri }
(3)	$mem \leftarrow$:=(mem_a, reg_i)	{ MOV Ri, a }
(4)	$mem \leftarrow$:=(ind(reg_i), reg_j)	{ MOV Rj, *Ri }
(5)	$reg_i \leftarrow$ ind(+(const_c, reg_j))	{ MOV c(Rj), Ri }
(6)	$reg_i \leftarrow$ +(reg_i, ind(+(const_c, reg_j)))	{ ADD c(Rj), Ri }
(7)	$reg_i \leftarrow$ +(reg_i, reg_j)	{ ADD Rj, Ri }
(8)	$reg_i \leftarrow$ +(reg_i, const_1)	{ INC Ri }

Options :

1. ✖ 4

2. ✖ 5

3.

✔ 6

4. ✖ 7

Question Number : 89 Question Id : 7877322249 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What is the name of the code optimization technique that transforms while(i <= limit -1) to the statements t = limit – 1; while(i <= t)?

Options :

1. ✖ Reduction in strength

2. ✔ Code motion

3. ✖ Common sub-expression elimination

4. ✖ Induction variable elimination

Question Number : 90 Question Id : 7877322250 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following entry in a Process Table is not related to process management?

Options :

1. ✖ Process group.

2. ✖ Priority.

3. ✔ Pointer to stack segment.

4. ✖ Signals.

Question Number : 91 Question Id : 7877322251 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Suppose that a process spends a fraction p of its time waiting for I/O to complete.

With n processes in memory at once, which of the following expression denotes CPU utilisation?

Options :

1. ✖ p^n

2. ✖ np

3. ✖ $1 - np$

4. ✔ $1 - p^n$

Question Number : 92 Question Id : 7877322252 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following are private to each thread?

(a) Address Space (b) Open files (c) Program Counter (d) Registers

Options :

1. ✔ Only (c) and (d)

2. ✖ Only (a) and (c)

3. ✖ Only (b) and (c)

4. ✖ Only (a) and (d)

Question Number : 93 Question Id : 7877322253 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Consider the following solution to the Critical section problem for the processes P0 and P1. Fig (a) shows the code for P0 and Fig (b) is for P1.
Which of the following condition is not met by this solution?

```
while (TRUE) {
    while (turn != 0)        /* loop */ ;
    critical_region( );
    turn = 1;
    noncritical_region( );
}
```

(a)

```
while (TRUE) {
    while (turn != 1)        /* loop */ ;
    critical_region( );
    turn = 0;
    noncritical_region( );
}
```

(b)

Fig. Solution to Critical Section problem

Options :

1. ✖ No two processes may be simultaneously inside their critical regions.

2. ✖ No assumptions may be made about speeds or the number of CPUs.

3. ✔ No process running outside its critical region may block any process.

4. ✖ No process should have to wait forever to enter its critical region.

Question Number : 94 Question Id : 7877322254 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The program shown in Figure below uses the Pthreads API. What would be output from the program at LINE C and LINE P respectively?

```
#include <pthread.h>
#include <stdio.h>

int value = 0;
void *runner(void *param); /* the thread */

int main(int argc, char *argv[])
{
int pid;
pthread_t tid;
pthread_attr_t attr;

   pid = fork();

   if (pid == 0) {/* child process */
      pthread_attr_init(&attr);
      pthread_create(&tid,&attr,runner,NULL);
      pthread_join(tid,NULL);
      printf("CHILD: value = %d",value); /* LINE C */
   }
   else if (pid > 0) {/* parent process */
      wait(NULL);
      printf("PARENT: value = %d",value); /* LINE P */
   }
}

void *runner(void *param) {
   value = 5;
   pthread_exit(0);
}
```

Options :

1. ✔ 5, 0

2. ✖ 0, 5

3. ✖ 0, 0

4. ✖ 5, 5

Question Number : 95 Question Id : 7877322255 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Consider the following set of processes, with the length of the CPU burst given in milliseconds:

Process	Burst Time	Priority
P_1	10	3
P_2	1	1
P_3	2	3
P_4	1	4
P_5	5	2

The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0. Smaller priority number indicates a higher priority.

Which of the following algorithm results in a minimum average waiting time?

Options :

1. ✖ First Come First Served

2. ✖ Round Robin with a quantum 1 millisecond

3. ✔ Shortest Job First

4. ✖ Non pre-emptive Priority scheduling

Question Number : 96 Question Id : 7877322256 Display Question Number : Yes Is Question

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

Consider a system with five processes P0 through P4 and three resource types A, B, and C. Resource type A has 10 instances, resource type B has 5 instances, and resource type C has 7 instances. Suppose that, at time T0, the following snapshot of the system has been taken:

	Allocation	*Need*	*Available*
	A B C	A B C	A B C
P_0	0 1 0	7 4 3	2 3 0
P_1	3 0 2	0 2 0	
P_2	3 0 2	6 0 0	
P_3	2 1 1	0 1 1	
P_4	0 0 2	4 3 1	

Which of the following respectively is the correct outcome of executing Banker's algorithm for the resource requests from P4 (3, 3, 0) and P0 (0, 2, 0)?

Options :

1. ✔ Not granted to both P4 and P0.

2. ✖ Granted to both P4 and P0.

3. ✖ Not granted to P4 but granted to P0.

4. ✖ Not granted to P0 but granted to P4.

Question Number : 97 Question Id : 7877322257 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Consider the following resource allocation graph in which Pi indicates process i and Rj indicates resource j.

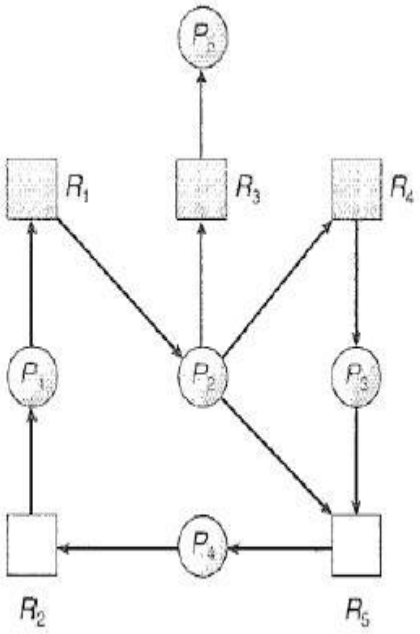


Fig. Resource allocation graph

How many edges will be there in the wait for graph corresponding to this resource allocation graph?

Options :

1. ✖ 4

2. ✖ 5

3. ✔ 6

4. ✖ 7

Question Number : 98 Question Id : 7877322258 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Consider the following segment table:

Segment	Base	Length
0	219	600
1	2300	14
2	90	100
3	1327	580
4	1952	96

What is the physical address of the logical address 4112?

Options :

1. ✖ 2064

2. ✖ 1439

3. ✔ Illegal address trap

4. ✖ 112

Question Number : 99 Question Id : 7877322259 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Assume that we have a demand-paged memory. The page table is held in registers. It takes 8 milliseconds to service a page fault if an empty frame is available or if the replaced page is not modified and 20 milliseconds if the replaced page is modified. Memory-access time is 100 nanoseconds. Assume that the page to be replaced is modified 70 percent of the time. What is the maximum acceptable page-fault rate for an effective access time of no more than 200 nanoseconds?

Options :

1. ✔ 6×10^{-6}

2. ✖ 5×10^{-5}

3. ✖ 5×10^{-6}

4. ✖ 4×10^{-5}

Question Number : 100 Question Id : 7877322260 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Consider the following schema:

Suppliers(*sid:* integer, *sname:* string, *address:* string)
Parts(*pid:* integer, *pname:* string, *color:* string)
Catalog(*sid:* integer, *pid:* integer, *cost:* real)

The key fields are underlined, and the domain of each field is listed after the field name. Therefore, sid is the key for Suppliers, pid is the key for Parts, and sid and pid together form the key for Catalog. The Catalog relation lists the prices charged for parts by Suppliers.

Which of the following relational algebra expressions does not return anything?

Options :

1. ✖ $\pi_{sname}(\pi_{sid}((\sigma_{color='red'}Parts) \bowtie (\sigma_{cost<100}Catalog)) \bowtie Suppliers)$

2. ✔ $\pi_{sname}(\pi_{sid}((\sigma_{color='red'}Parts) \bowtie (\sigma_{cost<100}Catalog) \bowtie Suppliers))$

3. ✖ $(\pi_{sname}((\sigma_{color='red'}Parts) \bowtie (\sigma_{cost<100}Catalog) \bowtie Suppliers)) \cap (\pi_{sname}((\sigma_{color='green'}Parts) \bowtie (\sigma_{cost<100}Catalog) \bowtie Suppliers))$

$$(\pi_{sid}((\sigma_{color='red'} Parts) \bowtie (\sigma_{cost<100} Catalog) \bowtie Suppliers)) \cap$$

$$(\pi_{sid}((\sigma_{color='green'} Parts) \bowtie (\sigma_{cost<100} Catalog) \bowtie Suppliers))$$

4. ✖

Question Number : 101 Question Id : 7877322261 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Consider the following schema:

Suppliers(*sid:* `integer`, *sname:* `string`, *address:* `string`)
Parts(*pid:* `integer`, *pname:* `string`, *color:* `string`)
Catalog(*sid:* `integer`, *pid:* `integer`, *cost:* `real`)

Which of the following is the correct description of the SQL query below?

```
SELECT    S.sname, COUNT(*) as PartCount
FROM      Suppliers S, Parts P, Catalog C
WHERE     P.pid = C.pid AND C.sid = S.sid
GROUP BY  S.sname, S.sid
HAVING    EVERY (P.color='Green')
```

Options :

1. ✔ For every supplier that only supplies green parts, print the name of the supplier and the total number of parts that they supply.

2. ✖ For every supplier that supplies green parts, print the name of the supplier and the total number of parts that they supply.

3. ✖ For every supplier that only supplies at least one green part, print the name of the supplier and the total number of parts that they supply.

4. ✖ For every supplier that supplies exactly one green part, print the name of the supplier and the total number of parts that they supply.

Question Number : 102 Question Id : 7877322262 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following options represent the correct I/O cost associated with the unclustered hash index for the Range Search operation?

We use B to denote the total number of data pages, R to denote the number of records per page, and D to denote the average time to read or write a page.

Options :

1. ✖ $Dlog_2B + \#matching\ pages$

2. ✔ BD

3. ✖ $2BD$

4. ✖ $Dlog_2B$

Question Number : 103 Question Id : 7877322263 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following is true regarding the schedule below?

T1:R(X), T2:R(X), T2:W(X), T1:W(X), T2:Commit, T1:Commit

Options :

1. ✖ Both Strict and Serializable

2. ✖ Neither Strict nor Serializable

3. ✖ Only Strict but not Serializable

4. ✔ Only Serializable but not Strict

Question Number : 104 Question Id : 7877322264 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Sixteen stations, numbered 1 through 16, are contending for the use of a shared channel by using the adaptive tree walk protocol. If all the stations whose addresses are prime numbers suddenly become ready at once, how many bit slots are needed to resolve the contention?

Options :

1. ✖ 9

2. ✖ 10

3. ✔ 11

4. ✖ 12

Question Number : 105 Question Id : 7877322265 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A computer on a 6-Mbps network is regulated by a token bucket. The token bucket is filled at a rate of 1 Mbps. It is initially filled to the capacity with 8 megabits. How long can the computer transmit at the full 6 Mbps?

Options :

1. ✖ 1.33 s

2. ✖ 1.50 s

3. ✔ 1.60 s

4. ✖ 1.70 s

Question Number : 106 Question Id : 7877322266 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Suppose that the TCP congestion window is set to 18 KB and a timeout occurs. How big will the window be if the next four transmission bursts are all successful? Assume that the maximum segment size is 1 KB.

Options :

1. ✖ 1 KB

2. ✖ 2 KB

3. ✖ 4 KB

4. ✔ 8 KB

Question Number : 107 Question Id : 7877322267 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Elliptic Curve Cryptography and RSA algorithm respectively are examples of which of the following cryptography types?

Options :

1. ✖ Symmetric and Asymmetric key cryptography.

2. ✔ Both are Asymmetric key cryptography.

3. ✖ Both are Symmetric key cryptography.

4. ✖ Asymmetric and Symmetric key cryptography.

Question Number : 108 Question Id : 7877322268 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

To speed up software development, parallelism between the different iterations can be employed. That is, a new iteration commences before the system produced by the current iteration is released, and hence development of a new release happens in parallel with the development of the current release. Which of the following lifecycle model proposes an approach for the aforementioned requirement?

Options :

1. ✖ Waterfall model.

2. ✖ Iterative Development.

3. ✖ Prototyping.

4. ✔ Timeboxing

Question Number : 109 Question Id : 7877322269 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What is the cyclomatic complexity of the following code segment?

```
A = 10
  IF B > C THEN
    A = B
  ELSE
    A = C
  ENDIF
Print A, B, C
```

Options :

1. ✖ 1

2. ✔ 2

3. ✖ 3

4. ✖ 4

Question Number : 110 Question Id : 7877322270 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following is not a built-in HTTP request method?

Options :

1. ✔ Retrieve

2. ✖ Connect

3. ✖ Trace

4. ✖ Head

Question Number : 111 Question Id : 7877322271 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The total number of subsets of a set of 4 elements is

Options :

1. ✖ 4^4

2. ✖ 210

3. ✖ 64

4. ✔ 2^4

Question Number : 112 Question Id : 7877322272 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

In a group (G,*) if for some $a \in G$, $a^2 = e$ then

Options :

1. ✖ $a = e$

2. ✖ $a = \sqrt{e}$

3. ✔ $a = a^{-1}$

4. ✖ $a = a^{-2}$

Question Number : 113 Question Id : 7877322273 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

If A is an $n \times n$ matrix, then the system of linear equations $Ax = 0$ has

Options :

1. ✖ no solution if $rank(A) < n$.

2. ✔ infinitely many solutions if $rank(A) < n$.

3. ✖ infinitely many solutions if $rank(A) = n$.

4. ✖ unique solution if $rank(A) < n$.

Question Number : 114 Question Id : 7877322274 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The eigenvalues of 3×3 matrix A are 3, 2 and -1. If $B = A^2 - A$, then the determinant of B is

Options :

1. ✔ 24

2. ✖ -2

3. ✖ 12

4. ✖ -12

Question Number : 115 Question Id : 7877322275 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Let $f:[a,b] \to R$, be three times differentiable function such that $f(a) = f(b) = f'(a) = f'(b) = 0$ then

Options :

1. ✔ $\exists\, c \in (a, b)$ such that $f^{(3)}(c) = 0.$

2. ✖ $\exists\, c \in (a, b)$ such that $f^{(4)}(c) = 0$

3. ✖ $\exists\, c \in (a, b)$ such that $f^{(5)}(c) = 0$

4. ✖ $\nexists\, c \in (a, b)$ such that $f^{(3)}(c) = 0$

Question Number : 116 Question Id : 7877322276 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Let $f: R^2 \to R$ be given as $f(x,y) = \begin{cases} \frac{xy^3}{x^2+y^6}, & (x,y) \neq (0,0) \\ 0, & (x,y) = (0,0) \end{cases}$

Options :

1. ✖ f is continuous at (0, 0)

2. ✖ f is differentiable only at (0, 0)

3. ✖ f is differentiable everywhere

4. ✔ f is not differentiable at (0, 0).

Question Number : 117 Question Id : 7877322277 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Company A produces 10% defective products, company B produces 20% defective products and company C produces 5% defective products. If choosing a company is equally likely event, then the probability that the product chosen is defective is

Options :

1. ✖ 5/60

2. ✔ 7/60

3. ✖ 8/60

4. ✖ 6/10

Question Number : 118 Question Id : 7877322278 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A manufacturer fills jars with coffee. The weight of coffee, W grams, in a jar can be modelled by a normal distribution with mean 232 grams and standard deviation 5 grams. Then the value of w such that $p\,(232 < W < w) = 0.20$ is (use $\Phi(0.52)=0.6985$, $\Phi(0.53)=0.7019$)

Options :

1. ✖ 234.125

2. ✖ 235.015

3. ✔ 234.625

4. ✖ 233.145

Question Number : 119 Question Id : 7877322279 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The degree of precision of the quadrature formula $\int_{-1}^{1} f(x)dx = f\left(\frac{-\sqrt{3}}{3}\right) + f\left(\frac{\sqrt{3}}{3}\right)$ is

Options :

1. ✖ 4

2. ✖ 1

3. ✖ 2

4. ✔ 3

Question Number : 120 Question Id : 7877322280 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The approximate value at the first iteration of Newton's method to approximate the root of $f(x) = cosx - x$ with initial guess $x_0 = \frac{\pi}{4}$ is

Options :

1. ✖ 0.71234

2. ✔ 0.73953

3. ✖ 0.72356

4. ✖ 0.77341