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OVERALL ANALYSIS | Solution Report

Q.1)

Subject: Linear Algebra | Max Marks: 1

Given d-dimensional vectors v1, v2 & v3 if v1.v2 = 0 and v2.v3 = 0, then which of the following statements are true:

#EASY, #MSQ

A v1 & v2 are parallel

B v1 & v2 are orthogonal/perpendicular — **Correct Option**

Solution: (B)
Dot product is zero implies the two vectors are perpendicular(angle between them is 90°).So vectors v1 and v2 are perpendicular to each other similarly v2 and v3 are also perpendicular.Clearly v2 is making an angle of 90° with v1, v3 vectors,hence v1 and v3 are parallel to each other.

C v2 & v3 are orthogonal/perpendicular — **Correct Option**

Solution: (C)
Dot product is zero implies the two vectors are perpendicular(angle between them is 90°).So vectors v1 and v2 are perpendicular to each other similarly v2 and v3 are also perpendicular.Clearly v2 is making an angle of 90° with v1, v3 vectors,hence v1 and v3 are parallel to each other.

D v1 & v3 are collinear/parallel — **Correct Option**

Solution: (D)
Dot product is zero implies the two vectors are perpendicular(angle between them is 90°).So vectors v1 and v2 are perpendicular to each other similarly v2 and v3 are also perpendicular.Clearly v2 is making an angle of 90° with v1, v3 vectors,hence v1 and v3 are parallel to each other.

Time taken to answer this question 00:03:38 hrs

Q.2)

Subject: Algorithms | Max Marks: 1

What is the running time of an insertion sort algorithm if the input is already sorted? (Assume n elements are present in an array)

#EASY # MCQ

A $O(n^2)$

B O(nlogn)

C O(n) — **Correct Option** | Attempted

Solution: (C)
If the input is pre-sorted, the running time is O(n), because the test in the inner for loop always fails immediately and the algorithm will run quickly.

D O(logn)

Time taken to answer this question 00:00:18 hrs

Q.3)

Subject: Algorithms | Max Marks: 1

What is the auxiliary space complexity of the standard merge sort?

#EASY # MCQ

A O(1) — Your answer is **Wrong**

B O(logn)

C O(n) — **Correct Option**

Solution: (C)
An additional space of O(n) is required in order to merge two sorted arrays. Thus merge sort is not an in place sorting algorithm.

D O(nlogn)

Time taken to answer this question 00:00:49 hrs

Q.4)

Subject: Python | Max Marks: 1

Given that x = 10, y = 9 and z = 2, which of the following evaluates to "True" in Python:

#EASY # MSQ

A y//z == (x//z)-1 — **Correct Option**

Solution: (A)
// :The floor division operator rounds the result down to the nearest whole number. 9//2 = (10//2)-1 = int(9/2) = 4
%: The modulo operator, denoted by %, is an arithmetic operator. The modulo division operator produces the remainder of an integer division.
9%2 = (10/2)%2 = 1

B y//z == int(y/z) — **Correct Option**

Solution: (B)
// :The floor division operator rounds the result down to the nearest whole number. 9//2 = (10//2)-1 = int(9/2) = 4
%: The modulo operator, denoted by %, is an arithmetic operator. The modulo division operator produces the remainder of an integer division.
9%2 = (10/2)%2 = 1

C y%z == (x/z)%z — **Correct Option**

Solution: (C)
// :The floor division operator rounds the result down to the nearest whole number. 9//2 = (10//2)-1 = int(9/2) = 4
%: The modulo operator, denoted by %, is an arithmetic operator. The modulo division operator produces the remainder of an integer division.
9%2 = (10/2)%2 = 1

D None of the above

Time taken to answer this question 00:01:44 hrs

Q.5)

Subject: Python | Max Marks: 1

Given that l = [1,2,3,4,5,6,7], then l[3::-1] evaluates to:

#EASY # MCQ

A [4,5,6,7]

B [7,6,5] Your answer is **Wrong**

C [4,3,2,1] **Correct Option**

Solution: (C)

D None of the above

Time taken to answer this question 00:00:23 hrs

Q.6) **Subject: Algorithms** **Max Marks: 1**

Which of the following is/are property/properties of a dynamic programming (DP) problem?
#EASY # MSQ

A Overlapping subproblems **Correct Option**

Solution: (A)
Optimal Substructure and Overlapping subproblems: If an optimal solution contains optimal sub solutions then a problem exhibits optimal substructure. When a recursive algorithm would visit the same subproblems repeatedly, then a problem has overlapping subproblems.In top-down dynamic programming we solve problems with a recursive function and memoize the results which uses call stack and adds overall space complexity.

B Optimal substructure/Recursion **Correct Option**

Solution: (B)
Optimal Substructure and Overlapping subproblems: If an optimal solution contains optimal sub solutions then a problem exhibits optimal substructure. When a recursive algorithm would visit the same subproblems repeatedly, then a problem has overlapping subproblems.In top-down dynamic programming we solve problems with a recursive function and memoize the results which uses call stack and adds overall space complexity.

C We can use iteration along with some memory to solve DP problems. **Correct Option**

Solution: (C)
Optimal Substructure and Overlapping subproblems: If an optimal solution contains optimal sub solutions then a problem exhibits optimal substructure. When a recursive algorithm would visit the same subproblems repeatedly, then a problem has overlapping subproblems.In top-down dynamic programming we solve problems with a recursive function and memoize the results which uses call stack and adds overall space complexity.

D Top-Down DP uses call stack which adds to the overall space complexity. **Correct Option**

Solution: (D)
Optimal Substructure and Overlapping subproblems: If an optimal solution contains optimal sub solutions then a problem exhibits optimal substructure. When a recursive algorithm would visit the same subproblems repeatedly, then a problem has overlapping subproblems.In top-down dynamic programming we solve problems with a recursive function and memoize the results which uses call stack and adds overall space complexity.

Time taken to answer this question 00:00:31 hrs

Q.7) **Subject: Python** **Max Marks: 1**

Given that a, b, c = 12, [11, 22], {True, False}
We can create a dictionary d using:
#EASY # MSQ

Correct Option

A d = {1:a, 2:b, 3:c}

Solution: (A)
You can define a dictionary by enclosing a comma-separated list of key-value pairs in curly braces ({}). A colon (:) separates each key from its associated value:

```
d = {
   <key>: <value>,
   <key>: <value>,
}
```

You can also construct a dictionary with the built-in dict() function. The argument to dict() should be a sequence of key-value pairs. A list of tuples works well for this:

```
d = dict([
   (<key>, <value>),
   (<key>, <value),
])
```

If the key values are simple strings or lists, they can be specified as keyword arguments. So here is yet another way

```
d=dict(
  <key> = <value>,
  <key> = <value>
)
```

B d = dict(x=a, y=b, z=c) **Correct Option**

Solution: (B)
You can define a dictionary by enclosing a comma-separated list of key-value pairs in curly braces ({}). A colon (:) separates each key from its associated value:

```
d = {
   <key>: <value>,
   <key>: <value>,
}
```

You can also construct a dictionary with the built-in dict() function. The argument to dict() should be a sequence of key-value pairs. A list of tuples works well for this:

```
d = dict([
   (<key>, <value>),
   (<key>, <value),
])
```

If the key values are simple strings or lists, they can be specified as keyword arguments. So here is yet another way

```
d=dict(
  <key> = <value>,
  <key> = <value>
)
```

C d = {a, b, c}

D d = [{a}, {b}, {c}]

Time taken to answer this question 00:01:36 hrs

Q.8)

Subject: Algorithms Max Marks: 1

Fill in the line of the following Python code for calculating the factorial of a number.
#EASY # MCQ

```
def fact(num):
    if num == 0:
        return 1
    else:
       return _____________________
```

A num*fact(num-1) **Correct Option** | Attempted

Solution: (A)
Suppose n=5 then, 5*4*3*2*1 is returned which is the factorial of 5.

B (num-1)*(num-2)

C num*(num-1)

D fact(num)*fact(num-1)

Time taken to answer this question 00:00:21 hrs

Q.9) **Subject: SQL** **Max Marks: 1**
How can you select all the even number records from a table?
#EASY # MCQ

A Select * from table where id / 2 = 0

B Select * from table where id / 2 != 0

C Select * from table where id % 2 != 0

D Select * from table where id % 2 = 0 **Correct Option** | Attempted

Solution: (D)

Time taken to answer this question 00:00:15 hrs

Q.10) **Subject: Calculus** **Max Marks: 1**
If y=f(x) is a nonlinear function, then the point on the curve where dy/dx = 0, could be:
#EASY #MSQ

A A maxima **Correct Option**

Solution: (A)
For a nonlinear function if dy/dx = 0 at a point on the curve means slope of the tangent is 0 at that point.So the point can be a maxima or minima depending on whether the curve is increasing or decreasing.Also if the curve has flat region the slope becomes 0 in that region.

B A minima **Correct Option**

Solution: (B)
For a nonlinear function if dy/dx = 0 at a point on the curve means slope of the tangent is 0 at that point.So the point can be a maxima or minima depending on whether the curve is increasing or decreasing.Also if the curve has flat region the slope becomes 0 in that region.

C A flat region on the curve of the function **Correct Option**

Solution: (C)
For a nonlinear function if dy/dx = 0 at a point on the curve means slope of the tangent is 0 at that point.So the point can be a

maxima or minima depending on whether the curve is increasing or decreasing.Also if the curve has flat region the slope becomes 0 in that region.

D None of the above

Time taken to answer this question 00:00:20 hrs

Q.11)

Subject: Python | Max Marks: 1

Given that x , y = 0, 1. Which of the following evaluates to “True” in Python:
#EASY # MSQ

A x == False — Correct Option

Solution: (A)
You can evaluate any expression in Python, and get one of two answers, True or False. 0 and 1 are analogous to booleans False and True.

B y == True — Correct Option

Solution: (B)
You can evaluate any expression in Python, and get one of two answers, True or False. 0 and 1 are analogous to booleans False and True.

C x + y == True — Correct Option

Solution: (C)
You can evaluate any expression in Python, and get one of two answers, True or False. 0 and 1 are analogous to booleans False and True.

D None of the above.

Time taken to answer this question 00:00:24 hrs

Q.12)

Subject: Python | Max Marks: 1

Given the 2 dicts:
d1 = {'a: 1, 'b': 2, ‘c': 3} and d2 = {‘x’: 30, ‘y’: 40, ‘z’: 50}
We merge them by:
#EASY # MSQ

A d1.update(d2) — Correct Option | Attempted

Solution: (A)
The update() method is used in the Python Dictionary to update the current dictionary with the second dictionary's content. Using the update() method, we can avoid creating a third dictionary to store the first dictionary element and then update the second dictionary element.

B d1 = d2.merge(d1)

C d1 = d1.merge(d2)

D None of the above

Time taken to answer this question 00:00:25 hrs

Q.13)

Subject: Calculus | Max Marks: 1

Given that y = |x|, which of the following are true

#EASY # MSQ

A The curve is symmetric about the y axis — **Correct Option**

Solution: (A)
The domain of absolute function is the set of all real numbers and range is the set of all real numbers greater than or equal to 0. That is, y≥0.
The graph of the absolute value function has a shape of "V" which is symmetric about y axis.

B The domain of y is (0, +inf)

C The range of y is (0, +inf) — **Correct Option**

Solution: (C)
The domain of absolute function is the set of all real numbers and range is the set of all real numbers greater than or equal to 0. That is, y≥0.
The graph of the absolute value function has a shape of "V" which is symmetric about y axis.

D None of the above

Time taken to answer this question 00:01:08 hrs

Q.14)

Subject: SQL | Max Marks: 1

Assume a schema of Emp (Id, Name, DeptId) , Dept (Id, Name).
If there are 10 records in the Emp table and 5 records in the Dept table, how many rows will be displayed in the result of the following SQL query:
Select * From Emp, Dept
#EASY # MCQ

A 5

B 10 — Your answer is **Wrong**

C 15

D 50 — **Correct Option**

Solution: (D)
The query will result in 50 rows as a "cartesian product" or "cross join", which is the default whenever the 'where' clause is omitted.

Time taken to answer this question 00:01:48 hrs

Q.15)

Subject: Python | Max Marks: 1

	0	1	2	3	4	5	6	7	8	9
0	15946875	17718750	19490625	21262500	23034375	24806250	25244493	27849149	30453805	23500000
1	12000000	12744189	13488377	14232567	14976754	16324500	18038573	19752645	21466718	23180790
2	4621800	5828090	13041250	14410581	15779912	14500000	16022500	17545000	19067500	20644400
3	3713640	4694041	13041250	14410581	15779912	17149243	18518574	19450000	22407474	22458000
4	4493160	4806720	6061274	13758000	15202590	16647180	18091770	19536360	20513178	21436271
5	3348000	4235220	12455000	14410581	15779912	14500000	16022500	17545000	19067500	20644400
6	3144240	3380160	3615960	4574189	13520500	14940153	16359805	17779458	18668431	20068563
7	0	0	4171200	4484040	4796880	6053663	15506632	16669630	17832627	18995624
8	0	0	0	4822800	5184480	5546160	6993708	16402500	17632688	18862875

Given the pandas data frame df shown below, the values in the yellow box can be extracted using the following code:

#EASY # MSQ

A df.iloc[5:8, 7:9]

B df.iloc[5:9, 7:10] **Correct Option**

Solution: (B)
.iloc is always positional indexed

C df.iloc[-4:, -3:]e **Correct Option**

Solution: (C)
.iloc is always positional indexed

D None of the above

Time taken to answer this question 00:01:04 hrs

Q.16)

Subject: Linear Algebra | Max Marks: 1

Given vectors v1 and v2 of same dimensionality, then the length of the projection of v1 on v2 is :

#EASY #MCQ

A v1.v2 / ||v2|| **Correct Option**

Solution: (A)
The vector projection is of two types: Scalar projection that tells about the length of vector projection and the other is the Vector projection which says about itself and represents the unit vector.
The scalar projection formula defines the length of the projection of v1 on v2 as v1.v2/|| v2||

B v1.v2

C v1.v2 / ||v1|| Your answer is **Wrong**

D $\sqrt{\|v_1\|^2 + \|v_2\|^2}$

Time taken to answer this question 00:00:58 hrs

Q.17)

Subject: Linear Algebra | Max Marks: 1

Which of the following statements in the options is correct given the following definitions:

A, B & C are vectors.
Commutative property: A.B = B.A
Distributive property: A·B+A·C=A·(B+C)
Associative property: a*(B.C) = (a*B).C where a is a scalar
The Dot product is: **(#EASY, #MCQ)**

A Commutative and associative but not distributive

B Commutative and distributive but not associative — Your answer is **Wrong**

C Only Distributive

D Commutative, associative and distributive — **Correct Option**

Solution: (D)
The dot product of two vectors is commutative A.B = B.A = AB cosΘ.
The dot product follows distributive law A.(B+C) = A.B +A.C.
In dot product, the order of the two vectors does not change the result. The associative law of multiplication also applies to the dot product

a*(B.C) = (a*B).C = B.(a*C)

We can say that "the dot product is associative with respect to scalar multiplication"

Time taken to answer this question 00:01:52 hrs

Q.18) **Subject: SQL** **Max Marks: 1**

Given the following tables:

sql> SELECT * FROM runners;

id	name
1	John Doe
2	Jane Doe
3	Alice Jones
4	Bobby Louis
5	Lisa Romero

sql> SELECT * FROM races;

id	event	winner_id
1	100 meter dash	2
2	500 meter dash	3
3	Cross country	2

What will be the resultant runner names of the query below?

SELECT * FROM runners WHERE id NOT IN (SELECT winner_id FROM races WHERE winner_id IS NOT null)

#EASY # MCQ

A EMPTY SET

B [Jane Doe, Alice Jones]

C [John Doe, Bobby Louis, Lisa Romero] — **Correct Option** | Attempted

Solution: (C)
The inner query returns winner_id's 2,3.The outer query returns runners whose id's are not 2,3.[JOHN DOE, Bobby Louis, Lisa Romero]

D [John Doe, Jane Doe, Alice Jones, Bobby Louis, Lisa Romero]

Time taken to answer this question 00:01:31 hrs

Q.19)

Subject: Linear Algebra | Max Marks: 1

In the equation of a plane: $w.x + w_0 = 0$, given that w is a unit vector:
#MEDIUM #MSQ

A w represents the vector passing through the origin and parallel to the plane

B w represents the vector passing through the origin and perpendicular to the plane — **Correct Option**

Solution: (B)
To represent a plane uniquely we need two pieces of information: a vector perpendicular/normal to it and it's distance from the origin. w is the vector perpendicular to the plane and passing through origin .w0 is the distance from origin to the plane,it is length of the projection (on vector w) of any point x, lying on the plane

C w_0 represents the length of the projection (on vector w) of any point x, lying on the plane. — **Correct Option**

Solution: (C)
To represent a plane uniquely we need two pieces of information: a vector perpendicular/normal to it and it's distance from the origin. w is the vector perpendicular to the plane and passing through origin .w0 is the distance from origin to the plane,it is length of the projection (on vector w) of any point x, lying on the plane

D None of the above.

Time taken to answer this question 00:00:32 hrs

Q.20)

Subject: Python | Max Marks: 1

Given the numpy arrays A1, A2 & A3. where:
A1.shape = (n,)
A2.shape = (m, 1)
A2.shape = (m, n)
Which of the following are possible:
#MEDIUM # MCQ

A np.concatenate((A3, A2), axis = 0)

B np.concatenate((A3, A1), axis = 1)

C np.concatenate((A3.T, A1.reshape(3, 1)), axis = 1) — **Correct Option**

Solution: (C)

D None of the above — Your answer is **Wrong**

Time taken to answer this question 00:02:10 hrs

Q.21)

Subject: Python | Max Marks: 1

What will be the output of the following Python code? **(#Medium #MCQ)**

```
lst = ['ab', 'cd']
for i in lst:
   lst.append(i.upper())
print(lst)
```

A ['AB', 'CD'] Your answer is **Wrong**

B ['ab', 'cd', 'AB', 'CD']

C ['ab', 'cd']

D none of the mentioned **Correct Option**

Solution: (D)
The loop does not terminate as new elements are being added to the list in each iteration.

Time taken to answer this question 00:00:15 hrs

Q.22)
Subject: Calculus | Max Marks: 1

Given that y = sin(x)/x, the limit of y as x tends to zero is ____. You are NOT allowed to use a plotting tool (Google plot or Python code or equivalent) to answer this question.
#MEDIUM #MCQ

A Zero

B Infinity

C One **Correct Option** | Attempted

Solution: (C)

D Indeterminate

Time taken to answer this question 00:00:22 hrs

Q.23)
Subject: Algorithms | Max Marks: 1

Given that f(n) = O(g(n)) and g(n) = O(h(n)) and h(n) = (i(n)) which of the following is/are True?
#MEDIUM # MSQ

A f(n)=O(h(n)) **Correct Option**

Solution: (A)

B i(n)=O(f(n))

C i(n)=O(h(n)) **Correct Option**

Solution: (C)

D g(n)=O(i(n)) Your answer is **Wrong**

Time taken to answer this question 00:01:19 hrs

Q.24)

Subject: Algorithms | Max Marks: 1

Which of the following statements is True about recursion?

#MEDIUM # MSQ

A Every recursive function must have a base case — **Correct Option**

Solution: (A)
Base criteria - One critical requirement of recursive functions is termination point or base case. There must be at least one base criteria or condition, such that, when this condition is met the function stops calling itself recursively.Missing base case results in unexpected behaviour.Using recursive algorithm, certain problems can be solved quite easily.

B Infinite recursion can occur if the base case isn't properly mentioned — **Correct Option**

Solution: (B)
Base criteria - One critical requirement of recursive functions is termination point or base case. There must be at least one base criteria or condition, such that, when this condition is met the function stops calling itself recursively.Missing base case results in unexpected behaviour.Using recursive algorithm, certain problems can be solved quite easily.

C A recursive function makes the code easier to understand — **Correct Option**

Solution: (C)
Base criteria - One critical requirement of recursive functions is termination point or base case. There must be at least one base criteria or condition, such that, when this condition is met the function stops calling itself recursively.Missing base case results in unexpected behaviour.Using recursive algorithm, certain problems can be solved quite easily.

D Every recursive function must have a return value — Your answer is **Wrong**

Time taken to answer this question 00:01:19 hrs

Q.25)

Subject: SQL | Max Marks: 1

Find the SQL statement below that is equal to the following:
SELECT name FROM customer WHERE state = 'VA';

#MEDIUM # MCQ

A SELECT name IN customer WHERE state IN ('VA');

B SELECT name IN customer WHERE state = 'VA';

C SELECT name IN customer WHERE state = 'V';

D SELECT name FROM customer WHERE state IN ('VA'); — **Correct Option** | Attempted

Solution: (D)
The SQL IN condition (sometimes called the IN operator) allows you to easily test if an expression matches any value in a list of values.

Time taken to answer this question 00:00:30 hrs

Q.26)

Subject: Python | Max Marks: 1

What will be the output of the following Python code?

```
P = [1,2,3]
Q = P.append(4)
print(P)
print(Q)
```

#MCQ #Medium

A [1,2,3,4]
[1,2,3,4]

B [1, 2, 3, 4] **Correct Option**
None

Solution: (B)
list.append is a built-in and therefore cannot be changed

C Syntax error Your answer is **Wrong**

D [1,2,3]
[1,2,3,4]

Time taken to answer this question 00:01:39 hrs

Q.27) **Subject: Calculus** **Max Marks: 1**
Derivative of sin(x)/x with respect to x is:
#HARD #MCQ

A (xcosx + sinx) / x

B $\frac{(xcosx - sinx)}{2^x}$

C **Correct Option** | Attempted
$\frac{(xcosx - sinx)}{x^2}$

Solution: (C)

D None of the above

Time taken to answer this question 00:04:26 hrs

Q.28) **Subject: Algorithms** **Max Marks: 1**
What is the time complexity of following code: **(MCQ #Hard)**

```
a = 0
i = n
while (i > 0):
    a += i
    i /= 2
```

A O(n)

B $O(\sqrt{n})$

C O(n/2)

D O(logn) **Correct Option** | Attempted

Solution: (D)
Solution:
After every iteration value of i will be divided by 2. So, time complexity: O(log(n))

Time taken to answer this question 00:01:57 hrs

Q.29)

Subject: Algorithms | Max Marks: 1

A subsequence of a given sequence is just the given sequence with some elements (possibly none or all) left out. We are given two sequences X[m] and Y[n] of lengths m and n respectively, with indexes of X and Y starting from 0. We wish to find the length of the longest common subsequence(LCS) of X[m] and Y[n] as l(m,n), where an incomplete recursive definition for the function l(i,j) to compute the length of The LCS of X[m] and Y[n] is given below:

l(i,j) = 0, if either i=0 or j=0
= expr1, if i,j > 0 and X[i-1] = Y[j-1]
= expr2, if i,j > 0 and X[i-1] != Y[j-1]

#MCQ #HARD

A expr1 ≡ l(i-1, j) + 1

B expr1 ≡ l(i, j-1)

C expr2 ≡ max(l(i-1, j), l(i, j-1)) — **Correct Option** | Attempted

Solution: (c)
In Longest common subsequence problem, there are two cases for X[0..i] and Y[0..j]
1) The last characters of two strings match.
The length of lcs is length of lcs of X[0..i-1] and Y[0..j-1]
2) The last characters don't match.
The length of lcs is max of following two lcs values
a) LCS of X[0..i-1] and Y[0..j]
b) LCS of X[0..i] and Y[0..j-1]

D expr2 ≡ max(l(i-1,j-1),l(i,j))

Time taken to answer this question 00:02:29 hrs

Q.30)

Subject: Python | Max Marks: 1

```
def  func(n):
    k = 0
        j = list(range(n))
        while (len(j)>3):
            for i in range(n-(n-2)):
                        k = k+n/2
                        j = j[:-1]
                return k
```

Given the code shown above, which of the following statements are correct:
#HARD # MCQ

A func(5) = 2.5 and the while loop will have 3 iterations.

B func(5) = 5 and the while loop will have 3 iterations.

C func(5) = 5 and the while loop will have 1 iteration. — **Correct Option** | Attempted

Solution: (c)

D None of the above

Time taken to answer this question 00:08:12 hrs

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