

COMPUTER SCIENCE & INFORMATION TECHNOLOGY

EXAM HELD ON

10th FEBRUARY 2024

MORNING SESSION

DETAILED SOLUTION BY TEAM



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TELEGRAM

[MCQ]

Q.1. The product of all eigen value the matrix Matrix $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$ is ____.

- (a) 1 (b) 2
(c) -1 (d) 0

Sol. (d)

Product of eigen values = determinate of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} = A$

$$|A| = \begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$$

$$R_3 \rightarrow R_3 \rightarrow R_2$$

$$R_2 \rightarrow R_2 \rightarrow R_1$$

$$\begin{vmatrix} 1 & 2 & 3 \\ 3 & 3 & 3 \\ 3 & 3 & 3 \end{vmatrix}$$

The determinant of A is 0, thus, the product of eigen values is 0.

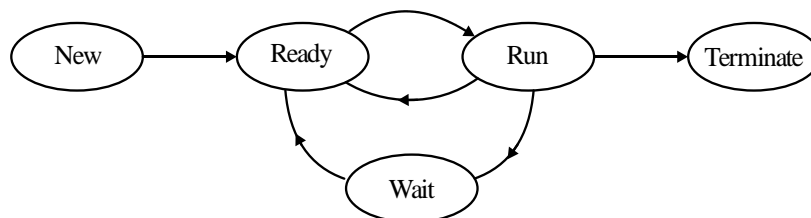
[MSQ]

Q.2. Which of the following process state transition is/are NOT possible?

- (a) Ready to Waiting (b) Running to Ready
(c) Running to Terminated (d) Waiting to Running

Sol. (a, d)

The process state diagram the following transitions take place.



Transition Ready to wait is not possible and wait to run is not possible.

[MCQ]

Q.3. In a B^+ tree the requirement of at least half full (50%) node occupancy is relaxed for which are of the following case?

- (a) All leaf node (b) Only the root node
(c) All internal nodes (d) Only the left most leaf node

Sol. (b)

In a B^+ tree at least half full (50%) node occupancy is relaxed for only the root node.

[MSQ]

Q.4. Which of the following is/are Bottom-up parser(s)?

- (a) LL(1) Parser (b) Predictive Parser
(c) Shift-reduce parser (d) LR parser

Sol. (c, d)

Top down = LR parser and SR Parser

Bottom up = LL(1) and predictive.

[MCQ]

Q.5. Consider the following C-Program.

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

```
int main()
```

```
{
```

```
    int a = 6;
```

```
    int b = 0;
```

```
    while (a < 10)
```

```
    {
```

```
        a = a/12 + 1;
```

```
        a+ = b;
```

```
    }
```

```
    printf("%d", a);
```

```
    return 0;
```

```
}
```

Which one of the following statements is correct?

- (a) The program get stuck in an infinite loop.
(b) The program prints 9 as output.
(c) Output 10.
(d) Output 6.

Sol. (a)

$$a = \boxed{6}1$$

$$b = \boxed{0}$$

$$6 < 12 \quad \text{I}^{\text{st}} \text{ iteration}$$

$$a = \frac{6}{12} + 1$$

$$a = 0 + 1 = 1$$

$$a = a + b = 1 + 0 = 1$$

IInd iteration

$$1 < 10$$

$$a = \frac{1}{12} + 1 = 0 + 1 = 1$$

$$a = a + b = 1 + 0 = 1$$

Now In every iteration a value will come out to be 1 1

Hence, program get stuck is an infinite loop.

[MCQ]

Q.6. $\log(p^2 + q^2) = \log p + \log q + 2\log 3$. find the value of $\frac{p^4 + q^4}{p^2 q^2}$.

(a) 9

(b) 79

(c) 81

(d) 83

Sol. (b)

We have given, $\log(p^2 + q^2) = \log(p q) + \log(3^2)$

$$\text{Or } \log\left(\frac{p^2 + q^2}{pq}\right) = \log 9 \Rightarrow \frac{p}{q} + \frac{q}{p} = 9 \quad (1)$$

$$\frac{p^4 + q^4}{p^2 q^2} = \frac{p^2}{q^2} + \frac{q^2}{p^2} = \left(\frac{p}{q}\right)^2 + \left(\frac{q}{p}\right)^2$$

$$= \left(\frac{p}{q} + \frac{q}{p}\right)^2 - 2$$

$$= (9)^2 - 2 = 81 - 2 = 79$$



[MCQ]**Q.7.** Which of the following statements about relation R in 1NF is/are True?

- (a) R cannot have a foreign key
- (b) R can have a multi-attribute key
- (c) R cannot have more than one candidate key
- (d) R cannot have a composite key

Sol. (b)

A relation R in 1NF can have multi-attribute key. While it can have a foreign key, can have more than one candidate key and also composite key.

[MCQ]**Q.8.** Given an integer array of size N, we want to check if the array is sorted (in either ascending or descending order). An algorithm solves this problem by making a single pass through the array and comparing each element of the array only with its adjacent elements. The worst-case time complexity of this algorithm is ____.

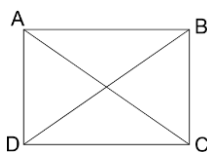
- (a) neither $O(N)$ nor Ω
- (b) Both $O(N)$ and $\Omega(N)$
- (c) $\Omega(N)$ but not $O(N)$
- (d) $O(N)$ but not $\Omega(N)$

Sol. (b)

The above array can be sorted using bubble sort, which will take one iteration if it will take $O(n)$, $\Omega(n)$ which is $\theta(n)$.

[NAT]**Q.9.** The number of spanning trees in a complete graph of 4 vertices labelled A, B, C and D is ____**Sol. (16 to 16)**

The number of spanning tree with n node of a complete graph = n^{n-2} .



Here $n = 4$

$$\begin{aligned}\text{Number of spanning tree} &= 4^{4-2} \\ &= 4^2 = 16\end{aligned}$$

[MSQ]**Q.10.** Which of the following fields is/are modified in the IP header of a packet going out of a network address translation (NAT) device from an internal network to an external network?

- (a) Header checksum
- (b) Source IP
- (c) Destination IP
- (d) Total length

Sol. (a, b)

For outgoing packet at NAT device.

1. Private IP will be replaced by Public IP in the Source IP field.
2. Destination IP is not changed. (Decided by Source Host Only)
3. New Header Checksum evaluated as modification in Source IP field.
4. Total Length field is remain same. (Decided by source only)

[NAT]

Q.11. Let A and B be non-empty finite sets such that there exist one-to-one and upto functions (i) From A to B and (ii) From $A \times A$ to $A \cup B$. The number of possible values of $|A|$ is ____.

Sol. (2 to 2)

The number of possible values of $|A|$ is 2.

[MCQ]

Q.12. Consider a system that uses 5 bits for representing signal integers in 2's complement format. In this system two integer A and B are represented as $A = 01010$ and $B = 11010$. Which one of the following operation will result in either an arithmetic overflow or an arithmetic underflow.

- | | |
|-------------|------------------|
| (a) $A - B$ | (b) $B - A$ |
| (c) $A + B$ | (d) $2 \times B$ |

Sol. (a)

Since 2's complement is used

$$A = 01010 \Rightarrow 10$$

$$B = 11010 \Rightarrow -6$$

Since 5 bits are used here

So range is -16 to 15

So $A - B$ i.e 16 is outside the range

[NAT]

Q.13. Consider the following two relation R(A, B) and S (A , C)

R	
A	B
10	20
20	30
30	40
30	50
50	95

S	
A	C
10	90
30	45
40	80

The total number of tuples obtained by evaluating the following expression

 $\sigma_{B < C} (R \bowtie_{R.A = S.A} S)$

Sol. (2)

 $\sigma_{B < C} (R \bowtie_{R.A = S.A} S)$ is natural join

Hence, tuples selected will be

A	B	A	C
10	20	10	30
30	40	30	45
30	50	30	45

Now, from here select $B < C$

Hence, tuples selected will be

A	B	A	C
10	20	10	30
30	40	30	45

[MSQ]

Q.14. TCP client P successfully establishes a connection to TCP server Q. Let N_P denotes the sequence number in the SYN sent from P to Q. Let N_Q denote the ACK number in the SYN ACK from Q to P. Which of the following statements is/are correct?

- (a) The sequence number N_P is always 0 for a new connection.
- (b) The ACK number N_Q is equal to $N_P + 1$
- (c) The sequence number N_P is chosen randomly by P.
- (d) The ACK number N_Q is equal to N_P .

Sol. (b, c)

$$N_Q = N_P + 1$$

 N_P : chosen randomly to prevent some kind of attacks.

[NAT]

Q.15. Consider a memory management system that uses a page size of 2 KB. Assume that both the physical and vertical address start from 0. Assume that page 0, 1, 2 and 3 are stored in the page frames 1, 3, 2 and 0, respectively. The physical address (in decimal format) corresponding to the vertical address 2500 (in decimal format) is ____0

Sol. (6596)

$$\text{Page Number} = \left\lfloor \frac{2500}{2048} \right\rfloor = 1$$

$$\text{Offset}(d) = 2500 \% 2048 = 452$$

Page 1 is present on frame 3.

$$\begin{aligned} \text{Hence physical address is} &= (3 \times 2048) + 452 \\ &= 6596 \end{aligned}$$

[MCQ]

Q.16. Consider the following recurrence relation:

$$T(n) = \begin{cases} \sqrt{n}T(\sqrt{n}) + n & \text{for } n \geq 1 \\ 1 & \text{for } n = 1 \end{cases}$$

Which are of the following is correct?

- | | |
|-------------------------------|--------------------------|
| (a) $\theta(n \log \log n)$ | (b) $\theta(n \log n)$ |
| (c) $\theta(n^2 \log \log n)$ | (d) $\theta(n^2 \log n)$ |

Sol. (a)

$$T(n) = \sqrt{n} \cdot T(\sqrt{n}) + n$$

$$n = 1$$

$$T(n) = \sqrt{n} \cdot T(\sqrt{n}) + n \dots (1)$$

$$= n^{1/2} \cdot T(n^{1/2}) + n \dots (1)$$

$$T(n^{1/2}) = n^{1/4} \cdot T(n^{1/4}) + n^{1/2} \dots (2)$$

Sub (2) in (1)

$$T(n) = n^{1/2} \left(n^{1/4} \cdot T(n^{1/4}) + n^{1/2} \right) + n$$

$$= n^{3/4} \cdot T(n^{1/4}) + 2n \dots (3)$$

$$= n^{1-\frac{1}{2^2}} \cdot T\left(n^{\frac{1}{2^2}}\right) + 2n \dots (4)$$

$$= n^{1-\frac{1}{2^k}} \cdot T\left(n^{\frac{1}{2^k}}\right) + k \cdot n$$

$$= \frac{n}{n^{\frac{1}{2^k}}} \cdot T\left(n^{\frac{1}{2^k}}\right) + k \cdot n$$

$$= \frac{n}{2} \cdot T(1) + n \log \log n$$

$$= \theta(n \log \log n)$$

[MSQ]

Q.17. The chromatic number of a graph is the minimum number of colour used in a proper colouring of the graph. Let G be any graph with n vertices and chromatic number K . Which of the following is/are always TRUE?

- (a) G contains a complete subgraph with k - vertices
- (b) G contains at least $k(k-1)/2$ edges
- (c) G contains an independent set of size at least n/k
- (d) G contains a vertex of degree at least k .

Sol. (b, c)

G contains at least $k(k-1)/2$ edges:

True

G contains an independent set of size at least n/k :

True**[MSQ]**

Q.18. The symbol \rightarrow indicates functional dependency in the context of a relational database. Which of the following option is/are TRUE?

- (a) $(x \rightarrow y \text{ and } y \rightarrow z) \text{ implies } x \rightarrow z$
- (b) $((x, y) \rightarrow z \text{ and } w \rightarrow y) \text{ implies } (x, w) \rightarrow z$
- (c) $(x, y) \rightarrow (z, w) \text{ implies } (x, y) \rightarrow z$
- (d) $(x, y) \rightarrow (z, w) \text{ implies } x \rightarrow (z, w)$

Sol. (a, c)

The symbol \rightarrow implies following functional dependencies:

1. $x \rightarrow y \text{ and } y \rightarrow z \text{ implies } x \rightarrow z$
2. $xy \rightarrow zw \text{ implies } xy \rightarrow z$

[NAT]

Q.19. A given program has 25% load / store instructions. Suppose the ideal CPI without any memory is 2. The program exhibits 2% miss rate on instruction cache and 8% miss rate on data cache. The miss penalty is 100 cycles. The speed up (round up to 2 decimal) achieved with a perfect cache (i.e., with No data or instruction cache misses):

Sol. (2.6)

Assume 100 inputs

1. 75 other instruction

2. 25 load/store instruction

So 100 instruction fetch, among those 25 load/store memory access.

Total memory access 12 times

Among these $\frac{100}{125}$ instruction access = 0.8

$\frac{25}{125}$ data access = 0.2

Instruction access time = $2 + 0.02 \times 100 = 5$ cycles

Data access time = $2 + 0.08 \times 100 = 10$ cycles

Average. CPI = $0.8 \times 4 + 0.2 \times 10$

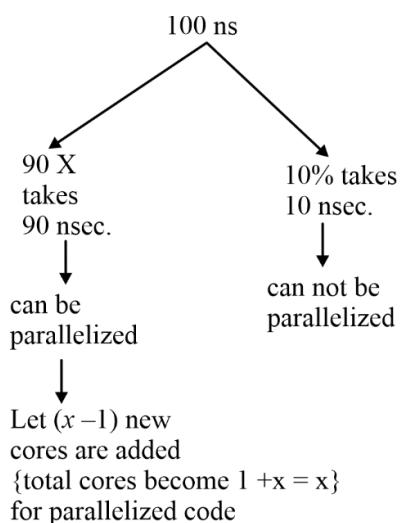
= $3.2 + 2 = 5.2$

Speed up = $\frac{5.2}{2} = 2.6$

[NAT]

Q.20. The baseline execution time of a program on a 2 GHz single core machine is 100n sec. The Code corresponding to 90% of the execution time can be fully parallelized The overhead for using an additional core is 10 n sec. When running on a multicore system. Assume that all cores in the multicore system run equal amount of time. The number of cores that minimize the execution time of the program is _____.

Sol. (3)



$$ET = \left[\left(\frac{90}{x} \right) + 10 \times (x-1) \right] + 10$$

for 10% remaining
 ↑
 10 nsec. overhead because
 of every near core

Minimization

$$\begin{aligned} \frac{d}{dx}[ET] &= 0 \Rightarrow \frac{d}{dx} \left[\frac{90}{x} + 10(x-1) + 1 \right] \\ &\Rightarrow \frac{-90}{x^2} + 10 = 0 \\ &\Rightarrow x^2 = 9 \Rightarrow \boxed{x=3} \end{aligned}$$

[NAT]

Q.21. Consider the entries shown below in the forwarding table of an IP router. Each entry consists of an IP prefix and the corresponding next hop router for packets whose destination IP address matches the prefix. The notation “/ N” in a prefix indicates a sub net mask with the most significant N bits set to 1.

Prefix	Next hop router
10.1.1.0/24	R ₁
10.1.1.128/25	R ₂
10.1.1.64/26	R ₃
10.1.1.192/26	R ₄

This router forwards 20 packets each to 5 hosts, The IP address of the hosts are 10. 1. 1. 16, 10. 1. 1. 72, 10. 1. 1. 132, 10. 1. 1. 191 and 10. 1. 1. 205. The number of packet forwarded via the next hop router R₂ is _____.

Sol. (40)

- Router forwarded 20 packets to each hosts
- Number of packets forwarded via the next hop router R₂ = ?

(i) Host₁ IP: 10.1.1.16

Net ID when masked with 25 bit netmask = 10.1.1.0

Packets to host₁ is not forwarded via R₂.**(ii) Host₂ IP: 10.1.1.72**

Net ID when masked with 25 bit netmask = 10.1.1.0

Packets to host₂ is not forwarded via R₂**(iii) Host₃ IP : 10.1.1.132**

Net ID when masked with 25 bit netmask = 10.1.1.128

Net ID when masked with 26 bit netmask = 10.1.1.128

Packets to Host₃ is forwarded via R₂

(iv) **Host₄ IP: 10.1.1.191**

Net ID when masked with 25 bit netmask = 10.1.1.128

Net ID when masked with 26 bit netmask = 10.1.1.128

Packets to Host₄ is forwarded via R₂.(v) **Host₅ IP: 10.1.1.128**

Net ID when masked with 25 bit netmask = 10.1.1.128

Net ID when masked with 26 bit netmask = 10.1.1.192

Packets to host₅ is forwarded via R₄

Router will choose more specific option over generic.

[20 packets host₃ + 20 packet host₅]: 40 packets via R₂**[MSQ]****Q.22.** Consider the following read -write schedule S over tree transactions T₁, T₂ and T₃ where the subscripts in the schedule indicate transaction ID:S: r₁(z); W₁(z); r₂(x); r₃(y); w₃(y); r₂(y); w₂(x); w₂(y)

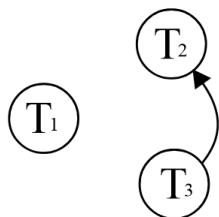
Which of the following transaction schedule is/are conflict equivalent to S?

(a) T₁, T₃, T₂(b) T₁, T₂, T₃(c) T₃, T₁, T₂(d) T₃, T₂, T₁**Sol. (a, c, d)**

Given schedule

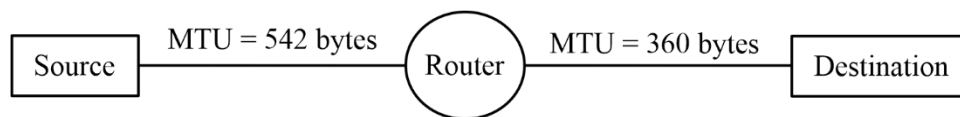
S: r₁(z); w₁(z); r₂(x); r₃(y); w₃(y); r₂(y); w₂(x); w₂(y)

T ₁	T ₂	T ₃
r(z)		
	r(x)	
		r(y)
		W(y)
	r(y)	
	w(x)	
	w(y)	

Order possible T₃ T₂ T₁ and T₁ T₃ T₂ and T₃ T₁ T₂

Sol. (6 to 6)

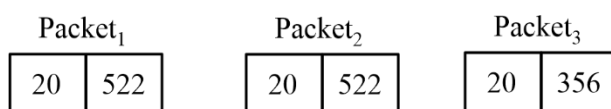
Fragments = 6



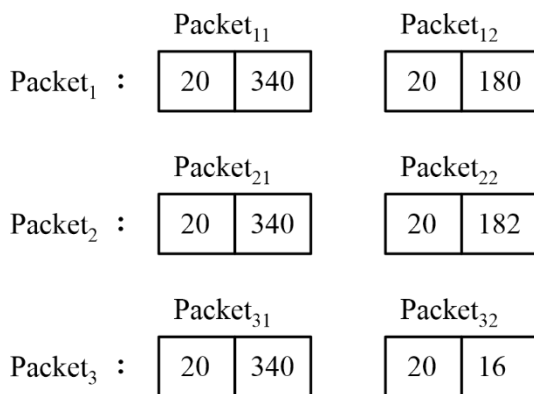
IP Datagram size = 1420 bytes

Header size = 20 bytes Payload size = 1400 bytes

- Due to 542 bytes MTU Maximum payload size can be 522 bytes
- IP Datagram is fragmented into 3 fragments.



- Due to 360 bytes MTU maximum payload size can be 340 bytes
- Each IP datagram is fragmented according.

**[MCQ]**

Q.25. Consider a binary min- heap containing 105 distinct elements. Let K be the index (in the underlying array) of the maximum element stored in the heap. The number of possible values of k is_____.

- | | |
|--------|--------|
| (a) 52 | (b) 27 |
| (c) 1 | (d) 53 |

Sol. (d)

There are 105 distinct elements,

MIN heap is given, there is K index which is of maximum element.

$$\text{Number of leafs} = \left\lceil \frac{105}{2} \right\rceil = \lceil 52.2 \rceil = 53$$

[NAT]

Q.26. Consider a 512 GB hard disk with 32 storage surface. There are 4096 sectors per track and each sector had 1024 bytes of data. The number of cylinder in the hard disk is ____.

Sol. (4096)

Disk size = number of surfaces \times number of tracks per surface \times number of sectors per track \times sector

$$512 \text{ GB} = 32 \times \text{tracs} \times 4096 \times 1024\text{B}$$

$$2^9 \times 2^{30} \text{ B} = 2^5 \times \text{tracks} \times 2^{12} \times 2^{10} \text{ B}$$

$$\text{Tracks} = 2^{12}$$

$$\text{Number of cylinders in disk} = \text{number of tracks per surface} = 2^{12} = 4096$$

[NAT]

Q.27. The number of edges present in the forest generated by DFS traversed of an undirected graph G with 100 vertices is 40. The number of connected components is ____.

Sol. (60)

The number of connected components,

$$n - k$$

$$= 100 - 40$$

$$= 60.$$

[NAT]

Q.28. Let $G = (V, \Sigma, S, P)$ be context free grammar in CNF with $\Sigma = \{a, b, c\}$ and V containing 10 variables symbols including the start symbol S. The string $w = a^{30} b^{30} c^{30}$ is derived form S. The no. of steps derivation $S \rightarrow^* w$ is ____?

Sol. (179)

$$a^{30} b^{30} c^{30} \Rightarrow n = 90$$

CNF

$$n \Rightarrow 2n - 1$$

$$\text{steps} = 2 \times 90 - 1$$

$$= 180 - 1$$

$$= 179$$

[NAT]

Q.29. Consider the following expression

$$r = 0^* + 1^*$$

$$s = 01^* + 10^*$$

number of string of length less than or less than equal to 5 which are neither in r nor in s is/are _____.

Sol. (44)

$$r = 0^* + 1^*$$

$$s = 01^* + 10^*$$

$$\text{Total possible string up to 5 length} = 2^{5+1} - 1 = 63$$

$$0 \text{ length strings} = 1 = \epsilon$$

$$1 \text{ length strings} = 2 = 0, 1$$

$$2 \text{ length strings} = 4 = 00, 01, 10, 11$$

$$3 \text{ length strings} = 2 + 2 = 000, 100, 011, 111$$

$$4 \text{ length strings} = 2 + 2 = 0000, 0111, 1000, 1111$$

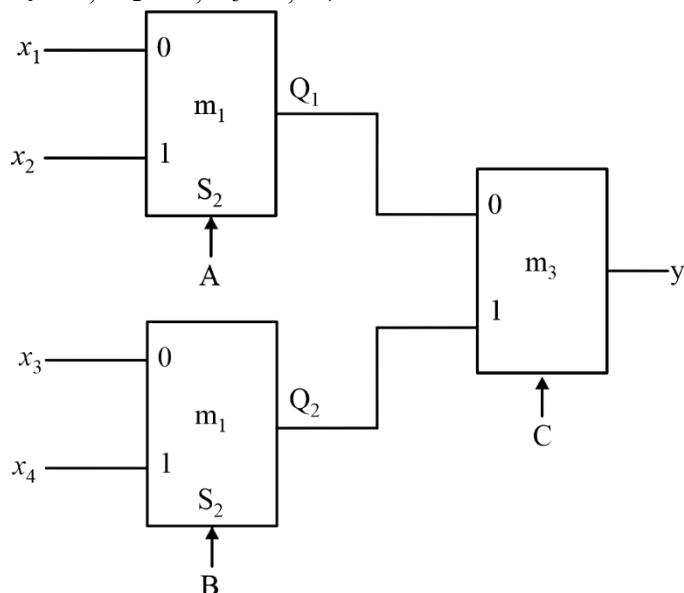
$$5 \text{ length strings} = 2 + 2 = 00000, 01111, 10000, 11111$$

Strings which are not present in both expression

$$= 63 - 19$$

$$= 44.$$

[NAT]

Q.30. $x_1 = 1, x_2 = 1, x_3 = 0, x_4 = 0$ 

The combination ABC that give option = 1



Sol. (4)

$$x_1 = 1$$

$$x_2 = 1$$

$$x_3 = 0$$

$$x_4 = 0$$

$$M_1 \text{ output} = A + \bar{A} = 1$$

$$M_2 \text{ output} = 0$$

$$M_3 \text{ output} = \bar{C}$$

A	B	C
0	0	0
0	0	1
0	1	0
1	0	0
1	0	1
1	1	0
1	1	1

$$\text{Possible combination of } \bar{C} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \\ 1 & 1 & 0 \end{bmatrix} = 4$$

[MCQ]

Q.31. Let L_1, L_2 be two reg. lang. and L_3 a language which is not reg. Which of the following is/are always. True

- (a) $\overline{L_1 \cup L_2}$ is reg. (b) $\overline{L_3}$ is not reg.
 (c) $L_1 = L_2 = \text{iff } L_1 \cap \overline{L_3} = \phi$ (d) $L_1 \cup L_3$ is not reg.

Sol. (a, b)

 $L_1 = \text{Regular}$ $L_2 = \text{Regular}$ $L_3 = \text{Non- Regular}$

- (a) $\overline{L_1 \cup L_2} = \overline{\text{Reg} \cup \text{Reg}} = \text{Reg}$
 (b) $\overline{\text{Non-reg}} = \text{Non-regular}.$
 (c) if and only if given so, false
 (d) $L_1 \cup L_3$ Can be regular.

[NAT]

Q.32.

operator	Precedence	Associatives
+	H	L
-	H	R
*	M	R
/	L	R

$$\text{Value} = 3 + 1 + 5 * \frac{2}{7} + 2 - 4 - 7 - \frac{6}{2}$$

Sol. (6)

$$3 + 1 + 5 \times \frac{2}{7} + 2 - 4 - 7 - \frac{6}{2}$$

$$4 + 5 \times \frac{2}{7} + 2 - 4 - 7 - \frac{6}{2}$$

$$9 \times \frac{2}{7} + 2 - 4 - 7 - \frac{6}{2}$$

$$9 \times \frac{2}{9} - 4 - 7 - \frac{6}{2}$$

$$9 \times \frac{2}{9} - 4 - \frac{1}{2}$$

$$9 \times \frac{2}{9} - \frac{3}{2}$$

$$9 \times 2 \times \frac{6}{2}$$

$$18 \times \frac{6}{2}$$

$$\frac{18}{3}$$

$$= 6$$

[NAT]

Q.33. The number of edges present in the forest generated by DFS traversed of an directed graph.

Sol. (60)

The number of connected components,

$$n - k$$

$$= 100 - 40$$

$$= 60.$$

[MCQ]

Q.34. About thread is/are true

- (a) Thread belonging to a process are by default not protected each other.
- (b) Each thread has it's file descriptive table for operfiles.
- (c) Threads can only be implement in kernal sapce
- (d) All the thread belonging to a process store a common stack.

Sol. (a)

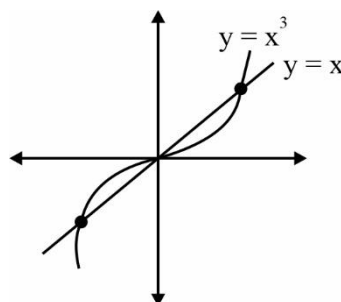
Thread belonging to a process are by default not protected each other:

True.

[NAT]

Q.35. If $f(x) = \max \{x, x^3\}$, than find the non-differentiable points of $f(x)$.

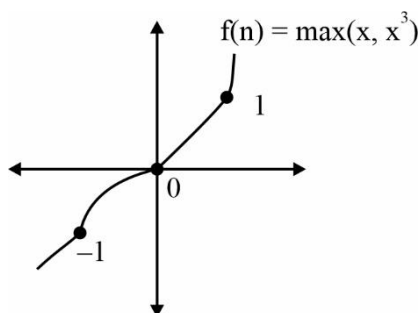
Sol.



Putting $x^3 = x$

$$x(x^2 - 1) = 0$$

$$x = 0, -1, 1$$



So we have three sharp points at $x = -1, 0, 1$. so, these are non-differentiable points.

$$M\text{-IF} \rightarrow f(x) = \max\{x, x^3\} = \begin{cases} x & ; n < -1 \\ x^3 & -1 < n < 0 \\ x & ; 0 < x < 1 \\ x^3 & , n > 1 \end{cases}$$

$$f'(x) = \begin{cases} 1 & ; n < -1 \\ 3x^3 & -1 < n < 0 \\ x & ; 0 < x < 1 \\ 3x^3 & , n > 1 \end{cases}$$

\therefore at $n = -1, 0$ and 1 , $LHD \neq RHD$ so all three points are non differentiable points.

[MCQ]

Q.36. Consider the following SDT code-

$S \rightarrow DHTU$ $\{ S.val = D.val + H.val + T.val + U.val \}$

$D \rightarrow 'M' D_1$ $\{ D.val = 5 + D_1.val \}$

$D \rightarrow \epsilon$ $\{ D.val = -5 \}$

$H \rightarrow 'L' H_1$ $\{ H.val = -10 \}$

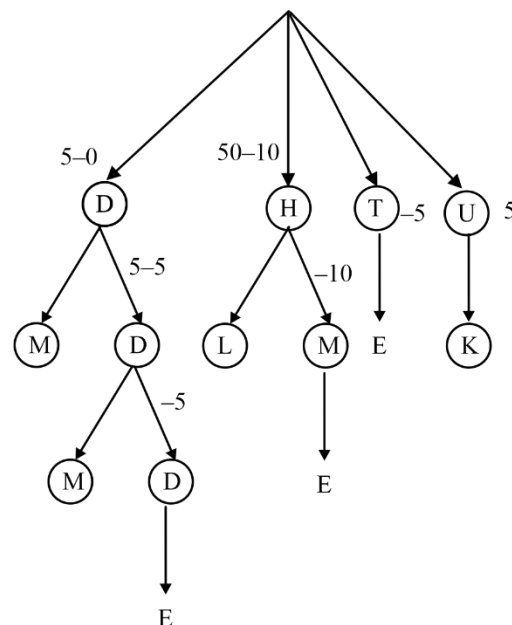
$T \rightarrow 'C' T_1$ $\{ T.val = 5 * 100 + T_1.val \}$

$T \rightarrow \epsilon$ $\{ T.val = -5 \}$

$U \rightarrow 'K'$ $\{ U.val = 5 \}$

For input 'MMLK' the value of S. Val is ____.

Sol. (45)



$$S.val = 5 + 40 - 5 + 5 = 45$$

[MCQ]

Q.37. Consider the following grammar where S, T and R are variable and {a, b, c, d, f} are terminals

$$S \rightarrow d \text{ at } (1)$$

$$T \rightarrow a S \mid b T \mid (2)$$

$$R \rightarrow (3) \mid \epsilon$$

$$\text{IF first } (S) = \{d, c, f\}$$

$$\text{First } (R) = \{c, \epsilon\}$$

$$\text{First } (T) = \{a, b, \epsilon\}$$

$$\text{Follow } (S) = \text{follow } (T) = \{c, f, s\}$$

$$\text{Follow } (R) = \{f\}$$

What of the following is correct production sequence of (1), (2) and (3).

$$(a) \quad S \rightarrow Rf, T \rightarrow \epsilon, R \rightarrow cTR$$

$$(b) \quad S \rightarrow fR, T \rightarrow \epsilon, R \rightarrow cT$$

$$(c) \quad S \rightarrow fF, T \rightarrow \epsilon, R \rightarrow c$$

$$(d) \quad S \rightarrow fR, T \rightarrow \epsilon, R \rightarrow cTR$$

Sol. (a)

Correct sequence is $S \rightarrow Rf, T \rightarrow \epsilon, R \rightarrow cTR$
all follow and first are satisfied.

[NAT]

Q.38. Median of

9, 10, 11, 14, 15, 17, 10, 69, 11, 13 is _____.

Sol. (12)

Given numbers are arranged in ascending order 9, 10, 10, 11, 11, 13, 14, 15, 17, 69

Number of observation = 10 so, the middle numbers are 11 and 13.

$$\text{Thus the median} = \frac{11+13}{2} = 12.$$

[NAT]

Q.39. A person has denomination Rs 1, 5 and 10 in ratio 5:3:13, then percentage of Rs 5 coin to total amount is

Sol. (10)

Number of coins = 5 : 3 : 13

$$(C_1 : C_5 : C_{10})$$

So money in the ratio = 5 : 15 : 130 i.e.

$$C_1 = 5\text{krs}, C_5 = 15\text{rs}, C_{10} = 130\text{k}$$

$$\text{Total money} = 5\text{k} + 15\text{k} + 130\text{k} = 150\text{k}$$

Now 15k rs is how much % of 150k ?

$$\text{Let it is } x \text{ then } 15\text{k} = \frac{x}{100} \times 150\text{k}$$

$$\Rightarrow x = \frac{1500}{150} = 10\%$$

[MCQ]

Q.40. Increasing order of the intensity.

Dry → Arid → Parched

The same intensity order for

Diet → Fat → ?

(a) Feast

(b) Starve

(c) Deny

(d) Reject

Sol. (a)

Dry → Arid → Parched?

Dry → Very Dry → Completely dry.

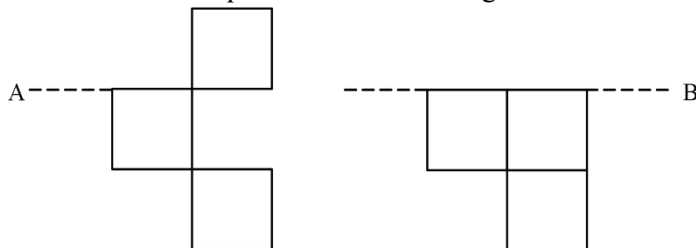
Diet → Fat → ?

Small meal → meal → large meal

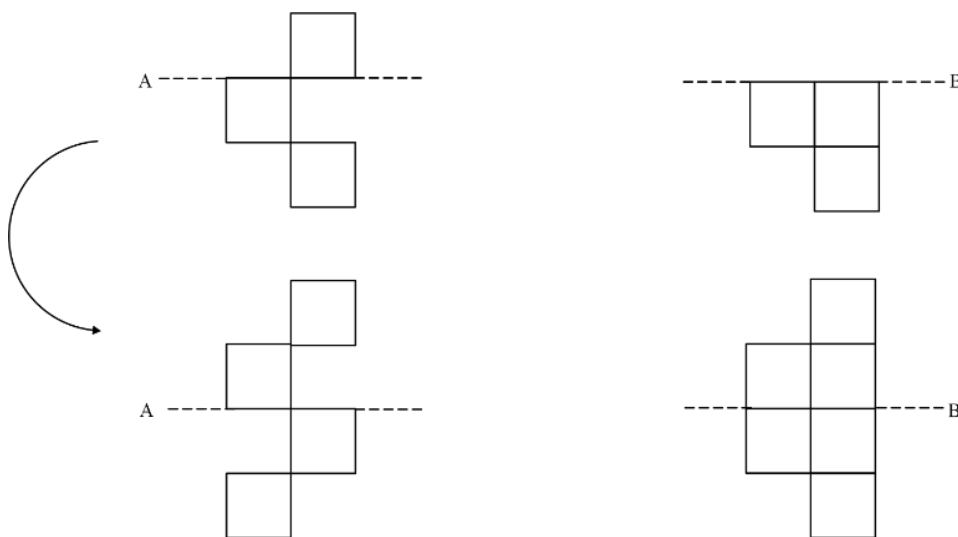
Hence, large meal is feast.

[NAT]

Q.41. Least number of square to be added in figure to make AB a line of symmetry is-



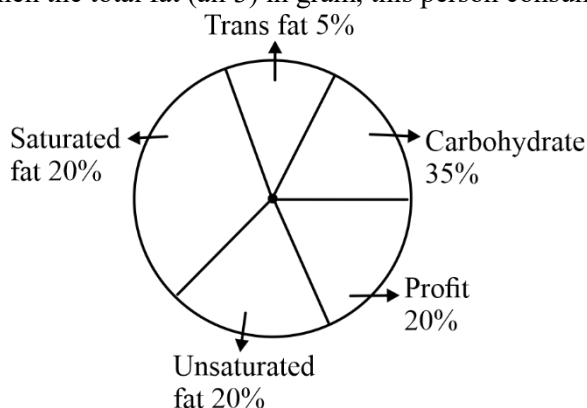
Sol. (6)



So least number of squares added = 6

[NAT]

- Q.42. Pie chart represent, 2000 Kcal diet of a person the typical energy density (Kcal/g) of there is given carbohydrates = 4, proteins = 4, unsaturated fat = 9, saturated fat = 9, trans fat = 9, then the total fat (all 3) in gram, this person consumes is-



Sol. (33.33)

Total kcal from fat = (5% + 20% + 20%) of 2000 = 45% of 2000 = 900 kcal.

So that fat in gm consumes by person = $\frac{900\text{kcal}}{27\text{kcal/gm}} = 33.33 \text{ gm}$

[NAT]

- Q.43. A rectangular sheet of $54 \times 4 \text{ cm}^2$ is taken. The two longer edges of the sheet are joined together to create a cylindrical tube. A cube whose surface area is equal to the area of sheet taken. Then the ratio of the volume of the cylindrical tube to the volume of the cube is _____.

Sol. (9/2)

A cube

$$54 \times 4 = 6a^2$$

$$a^2 = \frac{54 \times 4}{6} = 36, \quad a = 6$$

Now, $2\pi r = 4$

$$r = \frac{2}{\pi}$$

height = 54

$$\text{volume of cylinder} = \frac{1}{3} \times \pi \times r^2 \times h$$

$$\text{volume of cube} = a^3$$

Ratio of the volume of the cylindrical tube to the volume of the cube is

$$= \frac{1}{3} \times \pi \times r^2 \times h \times \frac{1}{a^3} = \frac{\pi \times \frac{4}{\pi^2} \times 54}{216} = \frac{1}{\pi} = 0.318 \text{ approx.}$$

[NAT]

Q.44. One bag contain 10 red and 15 black balls. One ball taken out from the bucket is red the find the prob that next ball will be black.

Sol. (0.625)

Req probability = P(Black ball in 2nd draw)

$$= \frac{{}^{15}C_1}{{}^{24}C_1} = \frac{15}{24} = \frac{5}{8} = 0.625$$

[MCQ]

Q.45. Two distinct non-zero variable x and y are such that $(x + y) \propto (x - y)$ then value $\frac{x}{y}$ will

be

(a) depend only on x

(b) is the constant

(c) depends on y

(d) depends on x and y

Sol. (a)

$$x + y \propto x - y$$

$$\text{or } x + y = k(x - y)$$

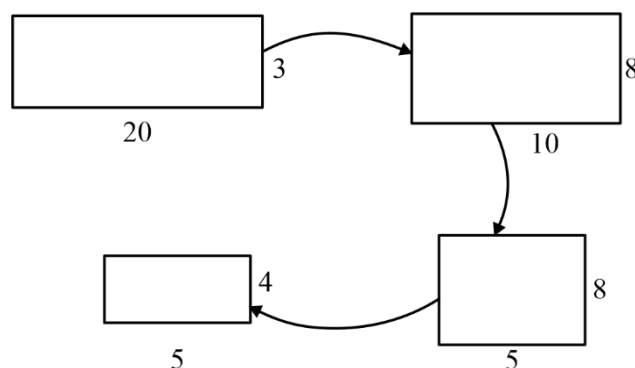
$$(1 - k)x = (-k - 1) \Rightarrow$$

$$\frac{x}{y} = 1 - \frac{k - 1}{1 - k} = \text{constant.}$$

[NAT]

Q.46. A sheet with dimensions 20cm × 3cm is folded 3 time each time it is folded 1r to it's longer side. What is the perimeter of the final sheet.?

Sol. (18)



$$\text{So, Required perimeter} = 2(5 + 4) = 18$$





THANK
YOU