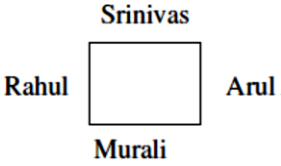
Solutions

General Aptitude

1. Ans. D.
Research in the workplace reveals that people work for many reason besides money.

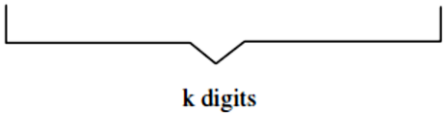
2. Ans. C.
After Rajendra chola returned from his voyage to Indonesia, he wished to visit the temple in Thanjavur

3. Ans. C.



4. Ans. D.
Factorization of 162 is $2\times3\times3\times3\times3\times3$
$y\times162$ is a perfect cube
$y\times2\times3\times3\times3\times3=$ Perfect cube
For perfect cube 2's & 3's are two more required each.

5. Ans. C.



Each digit can be filled in 7 ways as 0, 5 and 9 are not allowed. So each of these places can be filled by 1, 2, 3, 4, 6, 7, 8.
So required probability is $\left(\frac{7}{10}\right)^k$ *or* 0.7^k.

6. Ans. C.
The given contour is a hill station, the peak point of this hill station is P, it is under a contour of 550. At floods, the water level is 525m. So, the village of R, S and T are under a contour of 500. Therefore, these villages are submerged.

7. Ans. B.
In author's opinion, it is clearly visible that history is viewed through the filter of nationalism.

8. Ans. B.
If x > y; then |x-y| = x-y

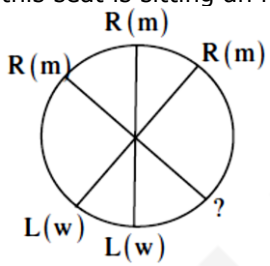
$$Exp=\frac{x+=y-(y-x)}{2}=y_{\min}$$

If x<y; then |x-y| = -(x-y) = y-x

$$Exp=\frac{x+=y-(y-x)}{2}=x_{\min}$$

The expression $\frac{(x+y)-|x-y|}{2}$ is equal to minimum of x & y.

9. Ans. A.
Out of six people, 3 place definitely occupied by right handed people as atleast 2 women are there so these two will sit adjacently. Now as only one seat is left it will be occupied by a left handed man because on right side of this seat is sitting an right handed man.



Therefore, answer should be 2 women.

10. Ans. D.
As there are 4 people A, G, N, S and 4 colours so without any restriction total ways have to be
Now, Arun → dislikes Red and
Shweta → dislikes white
So, 16-2 = 14 ways

Computer Science

1. Ans. A.
'X' is Gaussian random variable

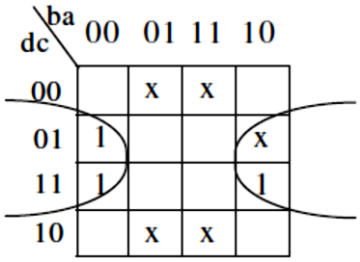
$$\Rightarrow X\sim N\left(0,\sigma^2\right)\ for\ -\infty<x<\infty$$

Given

$$=\begin{cases}0\ if\ -\infty<x\le0\\ x\ if\ 0<x<\infty,\ is\ a\ random\ \text{variable}\end{cases}$$

Since median is positional average
Therefore, median of Y is '0'.

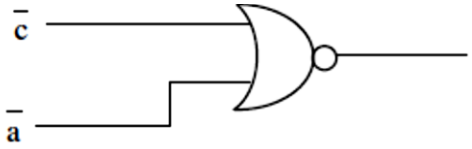
2. Ans. B.



$$F\left(a,b,c,d\right)=\bar{a}c\Rightarrow\overline{\overline{a.c}}=\overline{a+\bar{c}}$$

$$\left(\overline{x+y}=\bar{x}.\bar{y}\right)$$

$$=\overline{a+\bar{c}}$$



Only 1 NOR gate required

3. Ans. D.
By rule of contrapositive,
$\neg p \rightarrow \neg q \Leftrightarrow q \rightarrow p$

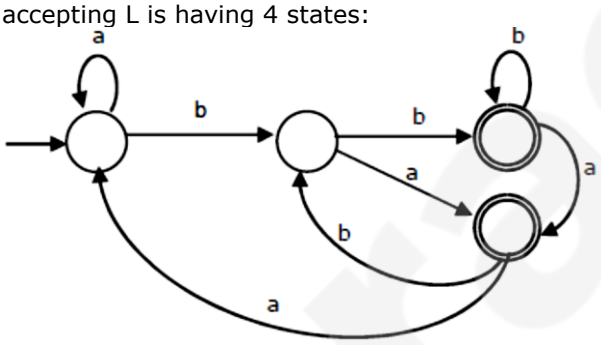
$q \rightarrow p \Leftrightarrow \sim q \vee p$

4. Ans. C.
Kruskal's algorithm follows greedy approach in order to find MST of a connected graph. Quick sort follows divide and conquer strategy. Floyd Warshal algorithm is used to find the shortest path between every pair of vertices and it follows dynamic programming strategy.

5. Ans. B.
Sender can launch a Birthday Attack to replace with fraudulent message, because he has the signature and he can decrypt the signature by his own public key and gets the hash value. With that same hash value, he can create another message and can be sent instead of original. Hence option (B) is correct.

6. Ans. C.
FOLLOW(Q) is FIRST(R) hence
FIRST (R)={w,ε}
We add 'w' in FOLLOW(Q) and for ϵ we calculate FIRST(S)
FIRST(S) ={y}
FOLLOW(Q) is {w,y}

7. Ans. C.
The regular expression can be described as "All strings over {a, b} ending with "ba" or "bb". The minimal DFA accepting L is having 4 states:

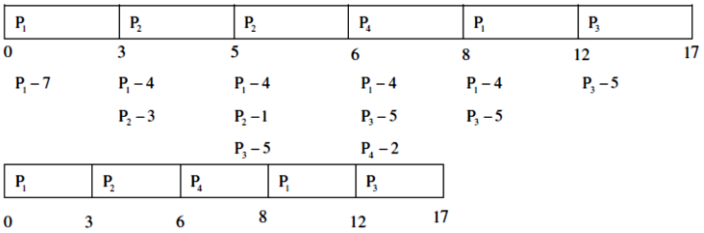


8. Ans. A.
$$\left.\begin{matrix} Number\ of\ memory\ access \\ in\ 1000\ instructions \end{matrix}\right\} = 1.4 \times 1000$$
$$= 1,400$$
$$\therefore Miss\ Rate = \frac{7}{1400 \times 0.1} = 0.05$$

9. Ans. D.

PID	AT	BT	CT	TAT	WT
P_1	0	7	12	12	5
P_2	2	3	6	3	0
P_3	5	5	17	12	7
P_4	6	2	8	2	0

Gantt chart:



∴ Average waiting time
$$= \frac{5+0+7+0}{4} = \frac{12}{4} = 3\ ms$$

10. Ans. D.
Threads of a process can share all resources except stack and register set.

11. Ans. C.
Since the scalars are not all zero
∴ The column vectors for i =1,2...,n are linearly dependent

$\Rightarrow |A| = 0$ and $b = \sum_{i=1}^{n} a_i \Rightarrow Ax = b$ has infinitely many solutions.

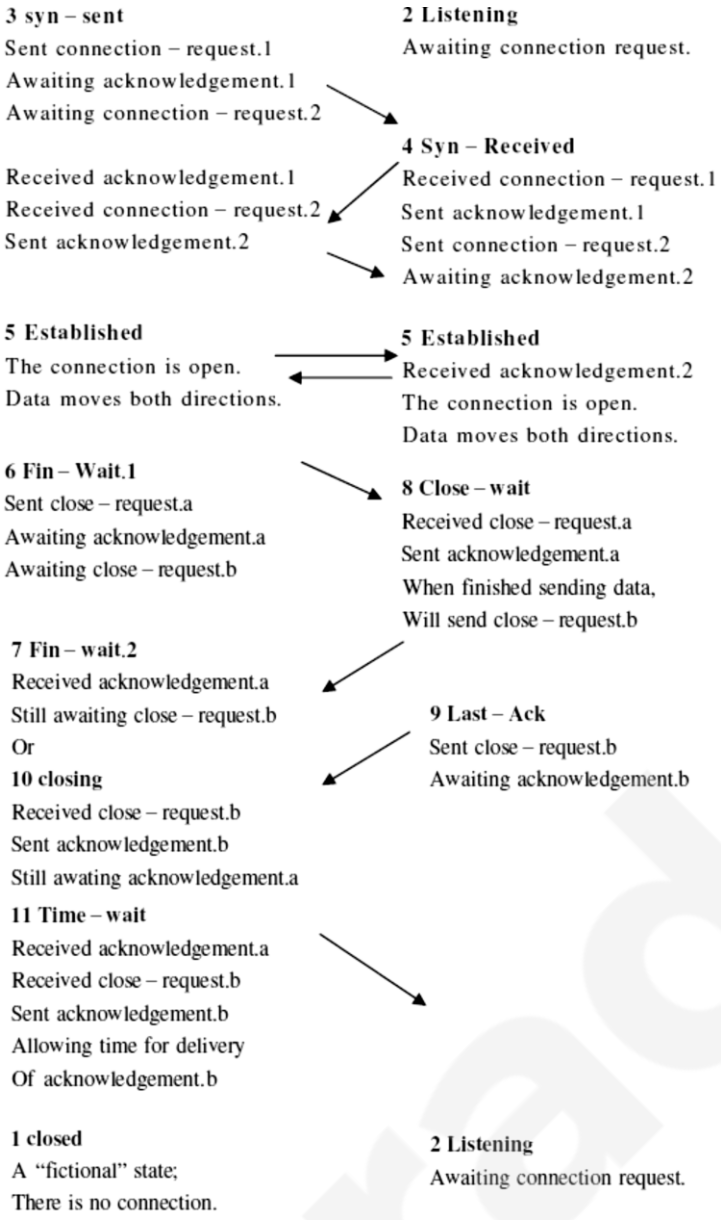
12. Ans. B.
While loop in Join Procedure moves the pointer 'p' to the last node of the list "n". And at the last statement, we are initializing the next of the last node of list n to start of list "m".
But in some cases it may dereference to null pointer.

13. Ans. D.
I=n-f.f
Max value 111.....1 i times .111.....1 (f times)
$$= 2^i - 1 + \left(\frac{1}{2} + \frac{1}{2^2} + ... + \frac{1}{2^f}\right) = 2^i - 1 + \frac{2^f - 1}{2^f}$$
$$= 2^i - 2^{-f}$$
$$\therefore 0\ to\ \left(2^i - 2^{-f}\right)$$

14. Ans. B.
a-code violates condition for static single assignment since p1 is initialized twice
c-p_2, p_4 & q_3 are not initialized anywhere
d – q_2 = p + q is incorrect code

15. Ans. D.
Direct access is possible with only index addressing mode.

16. Ans. D.
Client* Server*
*or vice-versa, though requests typically originate at clients.



17. Ans. B.

The given Grammar over Σ = {a, b, c} with S as the start symbol is

S → abScT | abcT

T→ bT | b

The minimum length string generated by the grammar is 1:

S→abcT→abcb; hence all variable greater than 1.

Other cases

S → abScT→ ab abScT cT → ab ab abScT cT cT →.....→ (ab)n (cT)n.

Here T can generate any number of b's starting with single b.

Hence The language is

$$L=\{(ab)^n cb^{m_1}cb^{m_2}cb^{m_3}cb^{m_4}.....$$

$$cb^{m_n}\mid m_1,m_2,m_3,m_4.....m_n n\geq 1\}$$

18. Ans. B.

$$\forall x\left(\exists yR(x,y)\right)\Rightarrow \exists y\exists xR(x,y)$$

$$\exists y\forall xR(x,y)\Rightarrow \forall x\exists yR(x,y)$$

$$\forall x\exists yR(x,y)\not\Rightarrow \exists y\forall xR(x,y)$$

$$\neg\exists x\left(\forall y\neg R(x,y)\right)\Leftrightarrow \forall x\exists yR(x,y)$$

19. Ans. C.

Overflow flag indicates an over flow condition for a signed operation. Some points to remember in a signed operation:

* MSB is always reserved to indicate sign of the number.
* Negative numbers are represented in 2's – complement.
* An overflow results in invalid operation.

2's complement overflow rules:

* If the sum of two positive numbers yields a negative result, the sum has- overflowed.
* If the sum of two negative number yields a positive result, the sum has overflowed.
* Otherwise, the sum has not overflowed.

Overflow for signed numbers occurs when the carry-in into the MSB (most significant bit) is not equal to carry-out. Conveniently, an XOR-operation on these two bits can quickly determine if an overflow condition exists.

Therefore, $\left(\left(A_7.B_7\right)\right)\oplus S_7=\overline{A_7}.\overline{B_7}.S_7+A_7.B_7.S_7=1)$ has overflowed.

20. Ans. C.

EC	
Dept Name	Num
AA	4
AB	3
AC	3
AD	2
AE	1

$$Avg\left(NUM\right)=\frac{13}{5}=2.6$$

21. Ans. A.

$$\underline{V\to W},\underline{VW\to X},Y\to V,Y\to X,Y\to Z$$

(W is extraneous)

$$V\to W,\underline{V\to X},\underline{Y\to V},\underline{Y\to X},Y\to Z$$

$$\therefore\ Y\to X\ is\ redundant$$

$$\therefore\ \{V\to W,V\to X,Y\to V,Y\to Z\}$$

22. Ans. B.

$$\frac{100}{n},10,\log_2 n,\sqrt{n},n$$

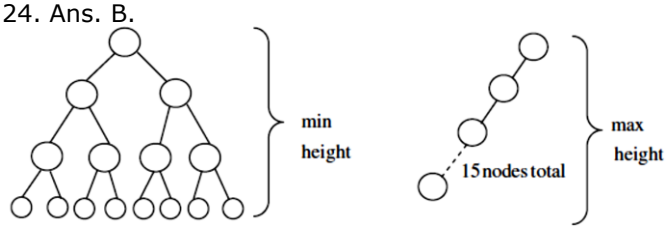
23. Ans. C.

A tree with 10 vertices has 9 edges.

$$As\sum d\left(v_i\right)=2\mid E\mid$$

$$\Rightarrow\sum d\left(v_i\right)=2\times 9=18$$

24. Ans. B.



Min height = floor($\log_2$ N) = floor(log 15)=3
Max height = 14, when the tree is either left skewed or right skewed.

25. Ans. D.
A) is wrong. We don't need to cast the result as void * is automatically and safely promoted to any other pointer type in this case.
B) It is discarded for obvious reason.
C) is wrong, because dangling pointer is nothing but the pointer which is pointing existing memory (deallocated or deleted memory) which is not happening here.
D) is the answer. When you are calling malloc second time, new location is assigned to x and previous memory location is lost and now we don't have no reference to that location resulting in memory leak.

26. Ans. B.

CLK	Q_1	Q_0
0	1	1
1	0	1
2	1	0
3	1	1
4	0	1

After 3rd clock pulse :11
After 4th clock pulse: 01

27. Ans. B.
{integers between 1 to 500 divisible by 3}
{integers between 1 to 500 divisible by 5}
{integers between 1 to 500 divisible by 7}
To find number of integers between 1 to 500 that are divisible by 3 or 5 or 7 is to find $|D_3 \cup D_5 \cup D_7|$

$$= [|D_3| + |D_5| + |D_7|] - [|D_3 \cap D_5| + |D_5 \cap D_7|] + [|D_3 \cap D_5 \cap D_7|]$$

$$= \left(\left[\frac{500}{3}\right] + \left[\frac{500}{5}\right] + \left[\frac{500}{7}\right]\right) - \left(\left[\frac{500}{15}\right] + \left[\frac{500}{21}\right] + \left[\frac{500}{35}\right] + \left[\frac{500}{105}\right]\right)$$

$$= (166 + 100 + 71) - (33 + 23 + 14) + 4$$

$$= 337 - 70 + 4 = 271$$

28. Ans. B.

I_1 $0-3$

I_2 $4-7$

I_3 $8-11$

I_4 $12-15$

$16-$

I_4 is the branch instruction & is the target.

0 = 16+ relative value
∴ relative value = -16

29. Ans. B.
Foo (3) calls foo (3) which in turn calls foo (3). This goes on infinite number of times which causes memory overflow and causes abnormal termination.
Bar (3) → bar (2) → bar (1) → bar (0) (return 0) from here onwards bar (1) will call bar (0) and bar (0) will return 0 to bar (1) & this goes on forever without causing memory overflow.

30. Ans. B.

Given Data	As per RSA Algorithm
P = 13	Step1: Calculate n = p×q = 13×17 = 221
Q = 17	Step2: Calculate ø(n) = (p-1)(q-1) = (12)(16) = 192
E = 35	Step3: de mod ø(n) = 1(or)de = 1modø(n) ⇒ d × 35 mod 192 = 1 ⇒ d = 11
D =?	

31. Ans. D.
In the given array the elements are 0's followed by 1's, which means array is already sorted. So, we can apply binary search. At each stage, we compare $A\left[\frac{low + high}{2}\right]$.
[Assuming 'A' is an array of 31 elements] with '1' and if it is 1 we check the left part recursively and if it is '0' we check the right part of the array recursively, which takes log2 31 comparisons in the worst case.

32. Ans. D.
1) $S \to SS \to aSbS \to abS \to abaSb \to abab$
2) $S \to aSb \to aSaSb \to aaaSb \to aaab$
3) $S \to SS \to aSbS \to abS \to abbSa \to$
$abbSaSa \to abbaa$
Given grammar generates all strings where $n(a) \geq n(b)$

33. Ans. C.

$$\lim_{x \to 1} \frac{x^7 - 2x^5 + 1}{x^3 - 3x^2 + 2} = \lim_{x \to 1} \frac{7x^6 - 10x^4}{3x^2 - 6x} = 1.$$

(Using L Hospital's rule)

34. Ans. B.
Given,
For Navie pipeline (NP)
Number of stages (k) = 5
T_p = max (stage delay + buffer delay)
T_p = max 7, 6, 22, 12, 5 = 22 n sec.
Number of instructions (n) = 20
So, erection time for navie pipeline
NP P ET = k + (n −1) ×T = 5 + 20 −1 × 22 = 528n sec
Now, for efficient pipeline
P k = 6, n = 20, T = 14nsec.
EP P E = k + (n −1) ×T = 6 + 20 −1 ×14 = 350n sec.
Therefore, Speedup = 528/350= 1.508

35. Ans. D.
Query which generates infinite number of tuples is called unsafe query. In the given question all the given queries generate finite number of tuples.

36. Ans. B.
Statement 1 is "TRUE". Because there can be a case when page selected to be replaced is by FIFO policy.
Statement 2 is "FALSE". Because LRU page replacement algorithm does not suffers from Belady's Anomaly. Only FIFO page replacement algorithm suffers from Belady's Anomaly.

37. Ans. B.
Count in the function total is static.

i	Count	total i
5	0	2
4	2	3(2+1)
3	3	5(3+2)
2	5	6(5+1)
1	6	7(6+1)
		=23

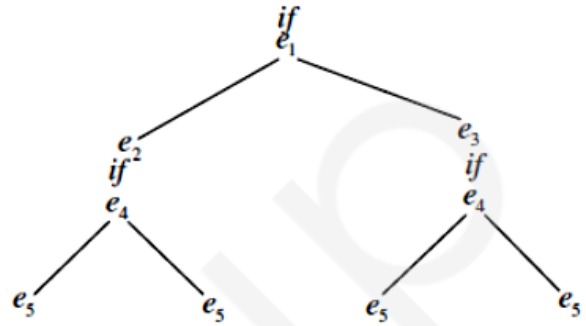
38. Ans. C.
x is pointer of string "abc" which is length 3.
S is pointer, that pointed x.
y is pointer of string "defgh" which is length 5.
t is pointer that pointed y.
Now, ((strlen (s) – strlen (t)) > c) is ((3– 5) > 0) is returns true, since (3 – 5 = –2) is nonzero value so, ternary operator '?' is returned strlen(s) which is 3 and assigned to len because ternary- operator returns first if condition is true else second. Therefore, final value is printed 3.c

39. Ans. A.
The language given over alphabets $\sum=\{a,b,c\}$ as $L_1=\{a^n b^n c^m \mid m,n\geq 0\}$ and $L_2=\{a^m b^n c^n \mid m,n\geq 0\}$
$L_1\cup L_2=\{a^n b^m c^k \mid n=m \text{ or } m=k, n,m\geq 0\}$ is a context free language. The context free grammar is:
$S\to AB \mid CD$
$A\to aAb \mid \varepsilon$
$B\to cB \mid \varepsilon$
$C\to aC \mid \varepsilon$
$D\to bSc \mid \varepsilon$
$L_1\cap L_2=\{a^n b^m c^k \mid n=m \text{ and } m=k, n,m\geq 0\}$ or $\{a^n b^n c^n \mid n\geq 0\}$ is a non-context free language.

40. Ans. D.
A miss is not considered a conflict miss if the block is accessed for the first time.
1st round: (2+2) misses
2nd round: (4+4) misses
∴ Total = 4 + (8 × 9) = 76 conflict misses

41. Ans. A.
Let $u=\begin{pmatrix}2\\0\end{pmatrix}$ and $v=\begin{pmatrix}0\\1\end{pmatrix}$
$\Rightarrow \|u\|=2\|v\|$ and $w=\begin{pmatrix}2\\\alpha\end{pmatrix}$
Now $\cos(u,w)=\cos(v,w)$
$\Rightarrow \frac{4}{(2)\sqrt{\alpha^2+4}}=\frac{\alpha}{(1)\sqrt{\alpha^2+4}}\Rightarrow \alpha=2$

42. Ans. C.
For 2 "if statements", 2^2 = 4 control flow paths are possible:

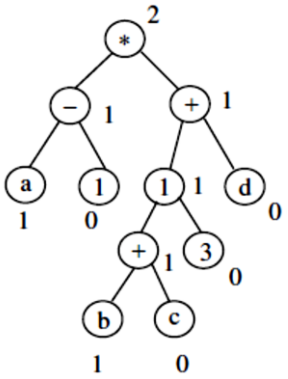


So for 10 "If statements", control flow paths will be there.

43. Ans. A.
Elder kills younger and youngers waits on elder. So both are not waiting for each other. Hence no deadlock and there won't be any starvation as well because the transaction who got killed will be starting with same time stamp.

44. Ans. A.
A TM is recursive iff it halts for every input string (either in accept or reject state).
Here, a computable function is defined in a similar way.

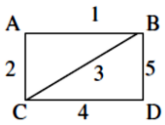
45. Ans. C.



The given expression is $(a-1)^*\left(\left((b+c)/3\right)+d\right)$
The optimal generated code is:

$LOAD\ R_1\ b$	$R_1\leftarrow b$
$LOAD\ R_2\ C$	$R_2\leftarrow c$
$ADD\ R_1\ R_2$	$R_1\leftarrow R_1+R_2$
$DIV\ R_1\ 3$	$R_1\leftarrow R_1/3$
$LOAD\ R_2\ d$	$R_2\leftarrow d$
$ADD\ R_1\ R_2$	$R_1\leftarrow R_1+R_2$
$LOAD\ R_2\ a$	$R_2\leftarrow a$
$SUB\ R_2 1$	$R_2\leftarrow R_2-1$
$MUL\ R_2\ R_1$	$R_2\leftarrow R_2 * R_1$

46. Ans. A.



Shortest path from B to C are two B-A-C and B-C both of weight '3'

47. Ans. C.

As per given question, there 'x' number of threads and 'y' number of locks for ensuring mutual exclusion while operating on shared memory locations

Option A: x = 1; y = 2

Means that 1 thread and 2 locks clearly showing that no deadlock situation

Option B: x = ; y = 1

Means that 2 threads and 1 lock → No deadlock situation

After usage of lock by 1 thread, it can release that lock and then 2nd thread can be used that lock. So no deadlock

Option C: x = 2; y = 2

Means that 2 threads and 2 locks → Deadlock can arise

Both threads can hold 1 lock and can wait for release of another lock

Option D: x = 1; y = 1

Means that 1 thread and 1 lock → No deadlock situation

Hence Option (C) is correct.

48. Ans. B.

Given Data:

$B = 1Mbps$

$T_{proc} = 0.25ms$

$T_p = 0.75ms$

$L = 1980\,Bytes$

$L_{OH} = 20\ Bytes$

$L_A = 20\ Bytes$

$Efficiency(\eta) = ?$

(i) $T_x = \frac{L}{B} = \frac{(1980+20)\times 8}{10^6} = \frac{2\times 8\times 10^3}{10^6}$

= 16 ms

(ii) $T_{ACK} = \frac{L_A}{B} = \frac{20\times 8}{10^6} = 0.16\ ms$

In stop-and-wait ARQ, efficiency

$$\eta = \frac{T_x}{T_x + T_{AcK} + 2T_p + T_{proc}} = \frac{16ms}{17.91ms}$$

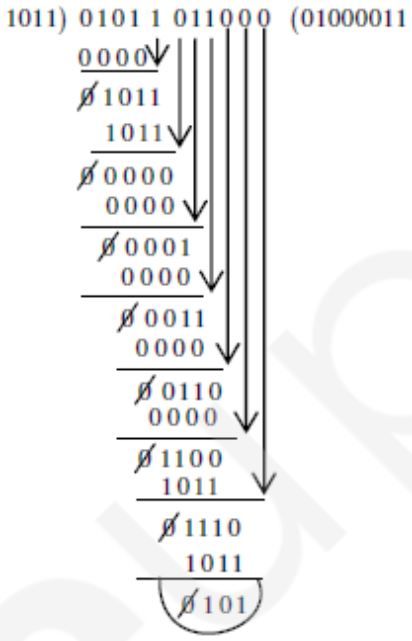
$$= 0.8933 \approx 89.33\%$$

49. Ans. C.

Given generator polynomial

$G(x) = x^3 + x + 1 \Rightarrow 1011$

$message\ m(x) = 01011011$



50. Ans. D.

$(p \to q) \to r$ is contradiction only when

p	q	r
T	T	F
F	T	F
F	F	F

And now for the above combination, the expression is always true when q is true. When q is false in the above combination (third one) will be false.

51. Ans. B.

Total bits $= 10 + \underbrace{\log_2\left\lceil \frac{N}{\quad} \right\rceil}_{\#\ of\ blocks} + \log_2 B$ (offset)

$$10 + \log_2(N) = \log_2\left(\frac{N}{16}\right) + T$$

where T is the required length of TAG field

$\therefore T = 14$

52. Ans. A.

In this the fun1() is calling fun2() after printing value and after returning from fun2(), it prints the same value. In the fun2() also the same thing happens So by looking options we can judge the correct sequence of output.

53. Ans. C.

$T1 = \{CA, CB, CC\}$

$T2 = \{SA, SC, SD, SF\}$

54. Ans. B.

$\rho(A) < n|A| = 0 \Rightarrow$ one eigen value must be '0' $\in [-5,5]$

$\therefore$ (I) is true

Let $A = \begin{bmatrix} 5 & 0 & 0 \\ 0 & -5 & 0 \\ 0 & 0 & 0 \end{bmatrix} \Rightarrow \sum_{i=1}^{3}\sum_{ij}^{3} A_{ij}^2 = 50$ and $\rho(A) = 2$

but eigen values of A are 0, −5,5

$\therefore$ The eigen value with the largest magnitude is not greater than 5

For and Let $A = \begin{bmatrix} 5 & 0 \\ 0 & 5 \end{bmatrix} \Rightarrow$ eigen values = 5,5

$\therefore$ One eigen value must be in [−5,5] and largest eigen value magnitude is not greater than 5

$\therefore$ (II) is false

55. Ans. B.

The Context free grammar given over alphabets $\sum\{a, b, c\}$ with S and T as non terminals are:

$G_1 : S \to aSb|T, T \to cT|\in$

$G_2 : S \to bSa|T, T \to cT|\in$

Lets $L(G_1)$ is the language for grammar G_1 and $L(G_2)$ is the language for grammar G_2

$L(G_1) = \{a^n c^m b^n \mid n, m \geq 0\}$

$L(G_1) = \{b^n c^m a^n \mid n, m \geq 0\}$

$L_1 \cap L_2 = \{c^m \mid m \geq 0\}$; which is infinite and regular

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