GATE

Subject : CS 2015_Set-2 - SOLUTIONS

TECHNICAL SECTION (Q. NO. 1 – 25) 1 MARKS

1. From S1,

   $P \rightarrow q$

   Also $p \rightarrow q \equiv \neg q \rightarrow \neg p$

   $\therefore$ elected $\rightarrow$ not corrupt

   From S2,

   kind $\rightarrow$ elected

   If $p \rightarrow q$ and $q \rightarrow r$, then $p \rightarrow r$

   $\therefore$ kind $\rightarrow$ not corrupt

   $\therefore$ (C) is the correct

2. Set A = {0, 1, ... 10}

   |A| = 11

   $\therefore$ Power set of A will have 2^{11} elements

   $\therefore$ 2048 is the answer

3. aRb if gcd of (a, b) is other than 1

   Let A = {1, 2, 3, 4}

   (2, 4) $\in$ R as gcd (2, 4) = 2

   (4, 2) $\in$ R as gcd (4, 2) = 2

   $\therefore$ R is symmetric

   R is not reflexive as (4, 4) $\notin$ R

   $\therefore$ gcd(4, 4) = 1

   By transitivity if (2, 4) $\in$ R and (4, 2) $\in$ R

   then (2, 2) should also belong to R

   But R is not reflexive

   $\therefore$ (2, 2) $\notin$ R

   and R is only symmetric

   $\therefore$ (D) is correct

4. $2100 = 7 \times 3 \times 100$

   $= 7 \times 3 \times (5 \times 2)^2$

$= 2^2\ 3^1\ 5^2\ 7^1$

$\therefore$ No. of divisors = (2 + 1) (1 + 1) (2 + 1) (1 + 1)

= 3.2.3.2

= 36

$\therefore$ 36 is the answer

5. Let $A = \begin{bmatrix} 4 & 5 \\ 2 & 1 \end{bmatrix}$

$|A - \lambda I| = 0$

$\therefore\ \lambda^2 - 5\lambda + (-6) = 0$

$\therefore\ \lambda^2 - 5\lambda - 6 = 0$

$\therefore\ \lambda^2 - 6\lambda + \lambda - 6 = 0$

$\therefore\ \lambda(\lambda - 6) + 1\ (\lambda - 6) = 0$

$\therefore\ (\lambda + 1)\ (6 - \lambda) = 0$

$\therefore\ \lambda = 6, -1$

Larger of (6, –1) = 6

$\therefore$ 6 is the answer

6. Since we have 'n' distinct elements, we can find an element that is neither maximum nor minimum in O(1) time

Consider only first three elements and compare them. So it takes constant time and is independent of 'n'

$\therefore$ (D) is the answer

7. The counting sequence is

0, 0, 1, 1, 2, 2, 3, 3, 0, 0.....

To count the sequence 0, 1, 2, 3, 0.... , we need 2 FFs

$\therefore$ To count the given sequence, we will need an additional one FF to distinguish between similar 0s, 1s, 2s and 3s

$\therefore$ We need 3 FFs

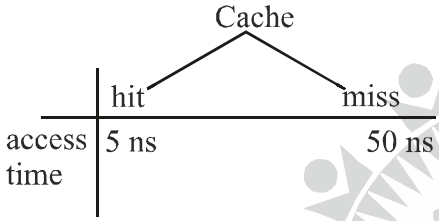
Alternate solution

The given sequence can be thought of as a mod -8 counter if we ignore the LSB bit output

0	0	0		0
0	0	1		0
0	1	0		1
0	1	1	Ignoring LSB,	1
1	0	0	we get	2
1	0	1		2
1	1	0		3
1	1	1		3

$\therefore$ We need 3 FFS

3 is the answer

8. 

hit rate = 80%

$\therefore$ Avg. read access time = 0.8 (5) + 0.2 (50)

= 4 + 10

= 14 nsec

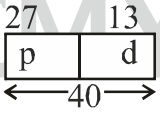
$\therefore$ 14 is the answer

9. L.A. 40 bits

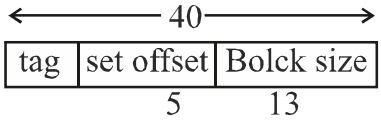
Page size = 8 KB

= $2^3 . 2^{10}$

$\therefore$ d = 13 bits



For set associative memory, format is



Here Block size = page size = 13 bits

No. of sets = 32 = 2^5

$\therefore$ Tag bits = 40 – (13 + 5)

= 22

$\therefore$ 22 is the answer

10. (I) Turing decidable languages are recursive languages

$\therefore$ If L is recursive, so is $\overline{L}$

$\therefore$ (I) is true

(II) is false because the definition of NP itself says a problem can be solved in polynomial time using non determinsitic Turing machine.

(III) is true. It is a theorem.

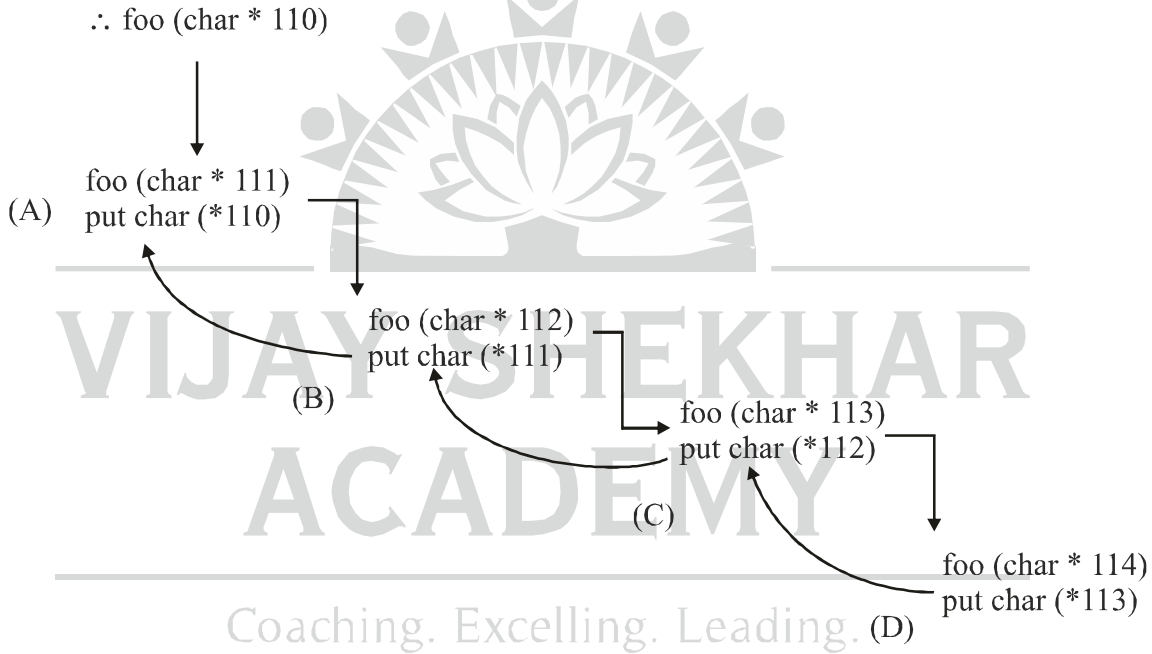
$\therefore$ (D) is the correct answer.

11. foo (char * a)

Let a =

A	B	C	D		E	F	G	H
110	111	112	113	114	115	116	117	118

as char takes 1 byte



$\therefore$ Output is DCBA

(D) is the choice

12. The given problem can be solved in Ω (log n)

we just need to compare the roots of two subtrees which are max-heaps and call the reverse-heapify ( ) function

$\therefore$ (A) is the answer

13. Leaves = esternal nodes = 20

we know that,

for a binary tree

$E = I + 1$

E – external nodes

I – internal nodes

$\therefore\ 20 = I + 1$

$\therefore\ \boxed{I = 19}$

19 is the answer

14. fun (5), x = 1, n = 5

f(1) _____ given

for k = 1,

$x = x + f(1) \times f(4)$

$x = 1 + 1 \times f(4)$

for k = 2,

$x = x + f(2) \times f(3) \rightarrow x = 1 + 1 * f(4) + f(2) * f(3)$

for k = 3,

$x = 1 + f(4) + f(2) \times f(3) + f(3) \times f(2)$

for k = 4,

$\therefore\ f(5) = x = 1 + f(4) + f(2) \times f(3) + f(3) \times f(2) + f(4) \times f(1)$ _____(i)

f(2)

$x = 1 + f(1).\ f(1) = 1 + 1 = 2$

$\therefore\ \boxed{f(2) = 2}$

f(3)

$x = 1 + f(1)\ .f(2) + f(2).\ f(1)$

$\therefore\ x = 1 + 2 + 2 = 5$

$\therefore\ \boxed{f(3) = 5}$

f(4)

$x = 1 + f(3) + f(2).\ f(2) + f(3)$

$x = 1 + 5 + 2.2 + 5$

$\therefore\ \boxed{f(4) = 15}$

$f(5) = 1 + 15 + 2 \times 5 + 5 \times 2 + 15$

$= 51$

$\therefore$ 51 is the answer.

15. SRS (Software Requirements Specification) is a document describing the functional and non functional requirements of a system to be developed

    It includes purpose, definition, scope, user interfaces, s/w and h/w interfaces, memory constraints, etc.

    It should not include design specification as we can do that only if when we gather the requirements

    $\therefore$ (C) is the answer

16. A problem is said to be NP-hard if all the problems in NP can be derived to this problem.

    Q1 reduces in polynomial time to 3–SAT

    $\therefore$ Q1 is in NP (as 3 SAT is NP complete)

    A problem is said to be NP-complete if it belongs to NP-complete if it belongs to NP as well as NP-Hard

    3SAT reduces to Q2 in polynomial time i.e. If Q2 can be solved in polynomial time then 3SAT can also be solved in polynomial time

    and we know 3-SAT is NP-complete

    $\therefore$ Q2 is NP-hard

    $\therefore$ (A) is correct

17. Lexical analysis – DFA Minimization

    Passing – Production tree

    Ragister allocation – Graph coloring

    Expression evalution – Post order traversal

    $\therefore$ (C) is correct

18. (A) is false as N2 may be evaluated before N1 on some input when the loop decision is false

    (B) is false as cycles will be present if there are loops

    (C) is correct

    (D) is false as a single node may contain multiple statements

    $\therefore$ (C) is correct answer

19. In a COCOMO (cost construction Model),

    Effort applies (E)

    $= a_b \ (k\text{loc})^{b_b}$ person – mouths

    Development time (D)

    $= c_b \ (\text{E})^{d_b}$ months

    # people required $= \dfrac{\text{E}}{\text{D}}$

    $\therefore$ (A) is correct

20. There seems to be a mistake in this question

As each process request atmost 2 resources mas requirement of eact process is 1

$\therefore$ P_1 P_2 P_3 P_4 P_5

1 1 1 1 1

6 – 5 = 1 we are left with 1 resource

which coould be with any of P_1 to P_5 not cousing deadlock.

So N = 6 should be the correct answer as each proces will hold 1 resource each leading to a deadlock

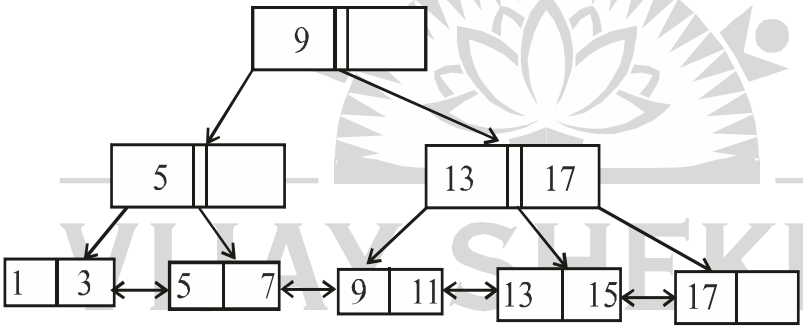
So, the options are wrong

21. Consistency is the constraint that sum of the accoutns x and y should remain same

Consistency is one of the ACID properties that ensures that data remains consistent in a database

$\therefore$ (B) is the answer

22.



The encircled nodes must be fetched

As B+ tree contains all records in the leaf nodes, we will first go to root node i.e. 9 then to its left i.e. 5 and then right and then travesse sequentially to the left until you find search key < 15

$\therefore$ we need to acess minimum 5 nodes

23. bind, listen, accept, recv are server side socket API functions.

A server initially binds a socket with a port number, then it listens to corresponding connection requests of the port number to which it is bound.

It then accepts the connection and once connection is established, data transfer is started.

$\therefore$ (B) is the corret option.

24. Transmission speed = 10^6 bps

L = 1000 Bytes

Effeciency = 25%

For stop and wait

$$\% \text{ efficiency} = \frac{Tt}{Tt + 2Pt} \times 100$$

$$25 = \frac{Tt}{Tt + 2Pt} \times 100$$

$Tt + 2Pt = 4\ Tt$

$\boxed{3Tt = 2Pt}$ _____ (i)

$$Tt = \frac{L}{T.S} = \frac{1000B}{10^6 \text{bps}} = \frac{8 \times 10^3 b}{10^6 \text{bps}}$$

$= 8 \times 10^{-3}$ sec

$= 8$ msec

$\therefore\ Pt = \frac{3Tt}{2}$ _____ from (i)

$\therefore\ Pt = \frac{3 \times 8}{2}$

$\therefore\ \boxed{Pt = 12 \text{m sec}}$

$\therefore$ 12 is the answer

25. An HTTP cookie is a small piece of data sent from a website and stored on the user's computer by the users web browser while the user is browsing.
Cookies are used to retain stateful information or to record users browsing activity.
$\therefore$ It is not a piece of code but a kind of an embedded message. A cookie has following compounents (i) Name (ii) Value (iii) Zero or more attributes (Name/value pairs)
$\therefore$ (A) is correct choice.

TECHNICAL SECTION (Q. NO. 26 – 55) 2 MARKS

26. (i) 128.96.171.92 ___ class B
for interface 0,
N/w No : 128 . 96 . 170 . 0 _____ class B
Net Mask : 255.255.254.0

170	10101010	171	10101011
$\wedge$254	11111110	$\wedge$254	11111110
170	10101010	170	10101010

$\therefore$ Matched

So it hops to Interface 0

(ii) 128.96.167.151 _____ class B

check for Interface 0,

167	10100111	168	10101000
∧254	11111110	∧254	11111110
166	10100110	168	10101000

∴ Not matched

check for Interface 1

168	101001000
∧254	1111111
168	10101000

∴ Not matched

check for R2

167	10100111	166	10100110
∧254	11111110	∧254	11111110
166	10100110	166	10100110

∴ Matched

∴ (i) – a (ii) – c

Only option (A) has such choices

∴ (A) is correct

27. UDP datagram size = 8880 b + 8B header = 8888

MTU = 1500 bytes

data in MTU = 1480 B (∴ 20B is for IP header)

$$\therefore \text{No . of fragments} = \left\lceil \frac{8888}{1480} \right\rceil$$

$$= \lceil 6.0054 \rceil$$

$$= 7$$

Fragment No.	Start Byte	Last Byte	Fragment offset
1	0	1479	0
2	1480	2959	185
3	2960	4439	370
4	4440	5919	555
5	5920	7399	740
6	7400	8879	925
7	8880	8887	1110

Fragment offset is calculated in 8 byte chunks

$$\text{fragment offset} = \frac{\text{first byte no. of that fragment}}{8}$$

$\therefore$ (C) is the correct option

28. TCP window maximum size is 65535

as sequence number is of 16 bits

$\therefore$ $[0 \text{ to } 2^{16-1}]$

TCP window scale option is needed for efficient transfer of data when the bandwidth delay product is greater than 64K (i.e. 65535)

for the given link, BW-delay product is

$\alpha \times 1048560$ b

For window scaling

$$\text{BW} - \text{delay} > 65535 \text{ B}$$

$$\frac{\alpha \times 1048560}{8} \text{ B} > 65535 \text{ B}$$

$\therefore$ $\alpha > 0.5$ sec

$\therefore$ $\alpha > 500$ msec

$\therefore$ $\alpha \approx 500$ msec

Scaling is done by specifying a one byte shift count in the header options field. The true receiver window size is left shifited by value in shift count. A maximum value of 14 may be used for shift count value

$\therefore$ Maximum possible window size with window scaling option = 65535×2^{14}

$\therefore$ (C) is the answer

29. The uncommitted transactions need to be undone i.e T1 and T3 and the commited transaction must be redone.

But we have a checkpoint here. So whenever a system crashes, it starts looking up from downward i.e. most recent transaction until it finds a checkpoint.

All the committed transactions before the checkpoint are stored to the disk and hence need not

be redone.

∴ We have to redo only T2

(A) is the correct choice.

30. R1

A	B
1	5
3	7

R2

A	C
1	7
4	9

R (A, B, C) = Full outer join

= Left outer join U Right outer join

LOJ R

A	B	C
1	5	7
3	7	–

ROJ R

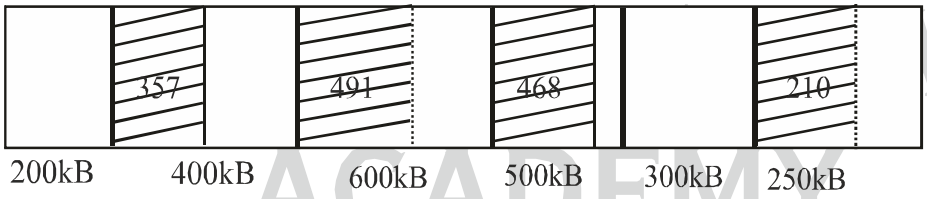
A	B	C
1	5	7
4	–	9

∴ FOJ (ABC) = R

A	B	C
1	5	7
3	7	–
4	–	9

∴ (C) is the correct answer

31.



Best fit algorithm allocates the block to smallest possible which is large enough to hold the allocated block.

∴ 200 KB and 300 KB are not alloted to any process

(A) is the answer.

32. For a disk

RPM = 15000

Data transfer rate = 50×10^6 BPs

$\therefore$ RPS = $\frac{15000}{60}$ = 250 rotations per second

Rotational delay = $\frac{1}{\text{RPS}} = \frac{1}{250}$ = 4 msec

$\therefore$ Average R.D. = $\frac{4}{2}$ = 2 msec

Tseek = 2 × avg R.D

= 2 × 2

∴ Tseek = 4 msec

In 1 sec $\rightarrow$ 50×10^6 B data

x sec $\rightarrow$ 512 B data

$$\therefore x = \frac{512}{50 \times 10^6}$$

$\therefore x = 1.024 \times 10^{-5}$ sec

But controller's transfer time = 10 × disk transfer time

$= 10 \times 1.024 \times 10^{-5}$ sec

$= 0.1024 \times 10^{-3}$ sec

= 0.1024 msec

∴ Total time to read or write 512 B sector of disk

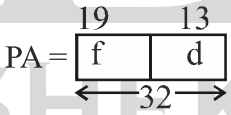
= Tseek + Tavg R.D. + Data transfer time

= 4 + 2 + 0.1024

= 6.1024 msce

∴ 6.1 is the correct answer.

33. P.A = 32 bits



Page size = Frame size = d

= 8 kB

$= 2^3.2^{10}$

$= 2^{13}$ B

∴ d = 13

∴ f = 32 – 13 = 19

Note : Page table contains frame number

Page table entry has 1 valid + 1 dirty bit + 3 permission bits + translation bits

There will be 19 translation bits to uniquely identify each of 2^{19} frames

∴ PTE size = 1 + 3 + 1 + 19 = 24 bits

Page table size = # pages × PTE size

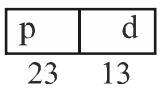
24 MB = # pages × 24 b

$$\therefore \text{\# pages} = \frac{24\text{MB}}{24\text{b}} = \frac{24 \times 8 \times \text{Mb}}{24\text{b}}$$

= 8M

$= 2^3 \cdot 2^2 = 2^{23}$ pages

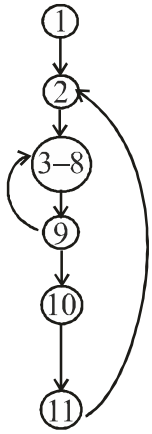
∴ Virtual address =



= 23 + 13 = 36 bits

36 is the correct answer

34. Control flow graph of the given code is :



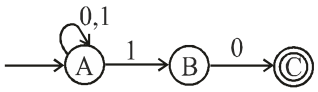
$\therefore$ # nodes = 6

$\therefore$ # edges = 7

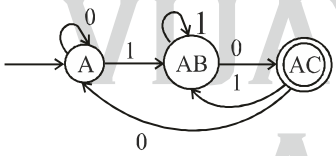
(B) is the answer

35. R.E. = $(0 + 1)^*$ (10)

NFA for the above regular expression is



DFA (minimized) for the above NFA is



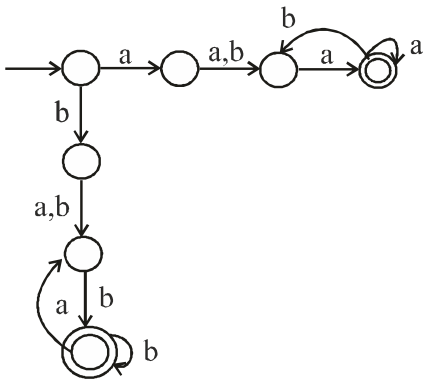
$\therefore$ Minimized DFA has 3 states

36. LI is regualr

Since $|x| > 0$, so any string starting and ending with same character is accepted by L1 and the remaining string in the middle becomes is 'x'

Eg : $\underbrace{1011}_{w}\ \underbrace{0}_{x}\ \underbrace{1101}_{w^R} \equiv \underbrace{1}_{w}\ \underbrace{0110110}_{x}\ \underbrace{1}_{w^R}$

DFA for L1 is



L2 is a CFL as there is a relation between m and n ($m \neq n$)

L3 is regular

Regular expression is a* b* c* i.e. any no. of a's followed by any no. of b's followed by any no. of c's

$\therefore$ (A) is the answer

37. Dijkstra's shortest path is based on Greedy design

Floyd warshall's all pairs shortest path is based on dynamic programming. It is also used to compute the transitive closure of a relation.

Binary search uses divide and conquer

DFS is also known as backtracking search on a graph as when there are no further paths from a node, it travesses backward until it finds an unvisited node.

$\therefore$ (C) is correct.

38.

1	2	5	14
3	4	6	23
10	12	18	25
31	∞	∞	∞

Delete 1, Move 2 →

2		5	14
3	4	6	23
10	12	18	25
31	∞	∞	∞

Move 4 →

2	4	5	14
3		6	23
10	12	18	25
31	∞	∞	∞

Move 6 →

2	4	5	14
3	6		23
10	12	18	25
31	∞	∞	∞

Move 18 →

2	4	5	14
3	6	18	23
10	12		25
31	∞	∞	∞

Move 25 →

2	4	5	14
3	6	18	23
10	12	25	∞
31	∞	∞	∞

$\therefore$ It is still a young tableau

No. of entries shifted = 5 (2, 6, 4, 18, 25)

$\therefore$ 5 is the answer

39. Let

a =

5	2	4	3	1	7	8	6
0	1	2	3	4	5	6	7

Partition (a, n) Let K = 3

2	4	3	1	(5)	7	8	6

pivot

return value (no. of elements to left of pivot)

$\therefore$ partition (a, n) = 4

$\therefore$ left-end = 4

left-end + 1 = 4 + 1 = 5 > k

return (a, left-end, k) // search in left half of array a [ ]

return (a + left_end + 1, n – left_end – 1, k – left_end – 1) // search in right half of array a [ ]

∴ (A) is the answer

40. We have only 10 buckets (0 to 9)

If we observe the functions $h(i) = i^3 \bmod 10$

(for i 0 to 9), it gives a unique units place digit for each number ending in (0 – 9).

$0^3 = \textcircled{0}$ $3^3 = 2\textcircled{7}$ $6^3 = 21\textcircled{6}$ $9^3 = 72\textcircled{9}$
$1^3 = \textcircled{1}$ $4^3 = 6\textcircled{4}$ $7^3 = 34\textcircled{3}$ $10^3 = 100\textcircled{0}$
$2^3 = \textcircled{8}$ $5^3 = 12\textcircled{5}$ $8^3 = 51\textcircled{2}$

and hence keys are uniformly distributed unlike other given functions.

∴ (B) is the answer

41. The secant method is the root finding algorithm that uses a succession of roots of secant lines to better approximate a root functions 'f'

The recurrence relation for secant method is

$$x_n = x_{n-1} - f(x_{n-1})\frac{x_{n-1} - x_{n-2}}{f(x_{n-1}) - f(x_{n-2})}$$

$$= \frac{x_{n-2} f(x_{n-1}) - x_{n-1} f(x_{n-2})}{f(x_{n-1}) - f(x_{n-2})}$$

It requires two initial values x_0 and x_1, which should ideally be choosen to lie close to the root.

∴ (D) is the answer

42. stkTop = –1

stkFunc (–1, 10)

// initializes size = 10

stkFunc (0, 5)

// pushes 5 onto the stack of size 10

stkFunc (0, 10)

// pushes 10 onto the stack of size 10

stkFunc (1, 0) + stkFunc (1, 0)

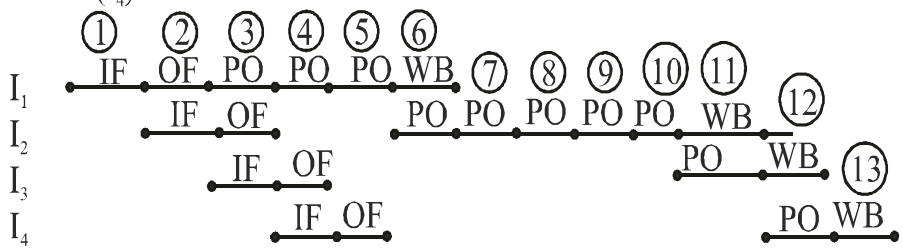
// pops 10 and 5 and their addition is returned

∴ output = 10 + 5 = 15

15 is the answer

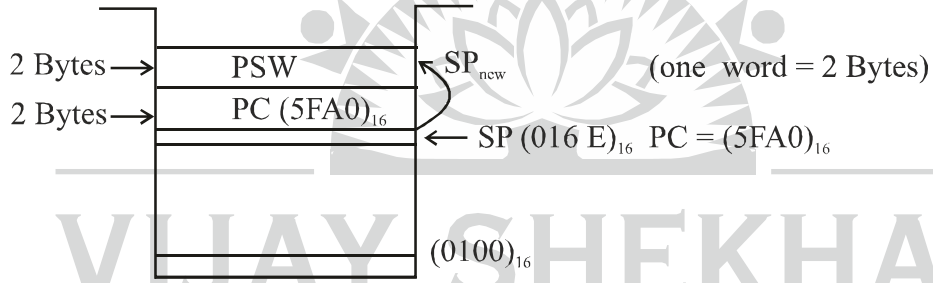
43.

	IF	OF	PO	WB
Mul (I_1)	1	1	3	1
Div (I_2)	1	1	5	1
ADD (I_3)	1	1	1	1
Sub (I_4)	1	1	1	1



$\therefore$ 13 clock cycles

44.



$\therefore$ New value of stack pointer = old value + 4B

$(016\ E)_{16} + (4)_{16}$

$$\begin{array}{r} 0000\ \ 0001\ \ 0110\ \ 1110 \\ +0000\ \ 0000\ \ 0000\ \ 0100 \\ \hline 0000\ \ 0001\ \ 0111\ \ 0010 \end{array}$$

$(0172)_{16}$

(D) is the answer

45. $E = \left(\bar{D} + A\bar{B} + \bar{A}C + A\bar{C}D + \bar{A}\bar{C}D\right)'$

$= \left(\bar{D} + A\bar{C} + A\bar{B} + \bar{A}C + \bar{A}\bar{C}D\right)' \left(\because \bar{D} + A\bar{C}D = \bar{D} + A\bar{C}\right)$

$= \left(\bar{D} + \bar{A}\bar{C} + A\bar{C} + \bar{A}C + A\bar{B}\right)' \left(\because \bar{D} + \bar{A}\bar{C}D = \bar{D} + \bar{A}\bar{C}\right)$

$= \left(\bar{D} + \bar{A}(C + \bar{C}) + A\bar{C} + A\bar{B}\right)'$

$= \left(\bar{D} + \bar{A} + A\bar{C} + A\bar{B}\right)'$

$= \left(\bar{D} + \bar{A} + \bar{C} + A\bar{B}\right)'$

$= \left(\bar{D} + \bar{A} + \bar{C} + \bar{B}\right)'$

$= \bar{\bar{A}}\ \bar{\bar{B}}\ \bar{\bar{C}}\ \bar{\bar{D}}$

$= ABCD$

$E = m_{15}$

No. of min terms = 1

46. $f(n) = x^{\frac{-1}{3}}$

$f'(x) = \frac{-1}{3}x^{-1/3-1}$

$= \frac{-1}{3}x^{-4/3}$

$= \frac{-1}{3x^{-4/3}}$

$f'(x) = \infty$ at $x = 0$

$\therefore$ f is not bounded in [–1, 1]

Also f is not continuous as it tends to ∞ at x = 0

Area is finite and can be calculated in the region bounded by x-axis and f(x) using integration.

$A = \int_{-1}^{1} |f(x)|\,dx$ which is non zero and finite

$\therefore$ only II and III are true

(C) is corrrect.

47. Row and column transformations so not change the value of the determinant

$$A = \begin{vmatrix} 3 & 4 & 145 \\ 7 & 9 & 105 \\ 13 & 2 & 195 \end{vmatrix} \xrightarrow{C_3 \to C_3/15} \begin{vmatrix} 3 & 4 & 3 \\ 7 & 9 & 7 \\ 13 & 2 & 13 \end{vmatrix}$$

$\therefore |A| = 0$ ($\because$ two same columns)

Note : Determinant value is multiplied by (–1) when we exchange any two rows or any two columns

48. X = {1, 2, 3, 4} Y = {a, b, c}

m = 4; n = 3

No. of onto functions is given by (X to Y)

$$S(m, n) = \sum_{i=0}^{n} (-1)^i \quad {}^{n}C_i (n-i)^m$$

$$= \sum_{i=0}^{3} (-1)i \quad {}^{3}C_i (3-i)^4$$

$$= {}^{3}C_0 (3)^4 - {}^{3}C_1 (2)^4 + {}^{3}C_2 (1)^4 - {}^{3}C_3 (0)^4$$

$= 3^4 - 3(2)^4 + 3(1)$

S(m, n) = 36

$\therefore$ 36 is the answer

onto function are possible (from m to n) only when |m| > |n|

when |m| < |n| then no such onto functions

when |m| = |n|

no. of onto functions = n! = no. of bijective functions

49. |X| = 2; |Y| = 20

$F = 20^2 = 400$ possible functions from X to Y

No. of one-one functions from X to Y

$= {}^{20}P_2 = 280$

$\therefore$ Probability ('f' is one-one) = $\dfrac{\text{Favourable cases}}{\text{Total cases}}$

$= \dfrac{380}{400} = 0.95$

$\therefore$ 0.95 is the answer

50. X0 = 1X1

X1 = 0X1 + 1X2

X2 = 0X1 + {λ}

X0 = 1X1

X0 = 11X2

X0 = 11 λ

X0 = 11 __ smallest string in X0

only option (C) has the smallest string as 11

$\therefore$ (C) is the correct choice

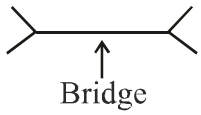
51. A graph is said to be self complementary if it has exactly half edges of that of a complete graph of n vertices

i.e. $\frac{1}{2}\left[\frac{n(n-1)}{2}\right] = \frac{n(n-1)}{4}$

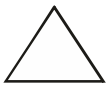
which is congruent to 0 mod 4 or 1 mod 4

$\therefore$ (D) is correct

52. (A) is false because a tree can have bridges

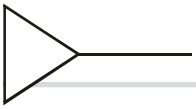


(B) is true



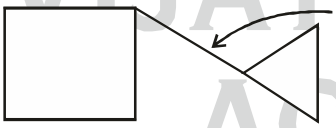
None of the edge is a bridge as its removal does not disconnect the graph

(C) is false



Here every edge is not a bridge (infact none of the edges is a bridge)

(D) is false because a graph with bridges can have cycles



$\therefore$ (B) is correct

53. (A) $\forall x \exists y\, R(x, y) \neq \exists y \forall x R(x, y)$

(B) $\left(\forall x[\exists y\, R(x, y) \rightarrow S(x, y)] \not\rightarrow \forall x \exists y S(x, y)\right)$

Meaning is lost because of absence of R(x, y)

(C) is true as $P \rightarrow Q \equiv \neg P \vee Q$

Also quantifiers are preserved

(D) is false when P(x, y) = x < y

as if x < y then P(y, x) y > x cannot be true

$\therefore$ (C) is correct

54. Code inspection and code walk through are two different terms

∴ (B) is false

In software engineering, a 'walk through' is a form of software peer review in which a designer or programmer leads members of the development team and other interested parties through a software product, wherein the participants ask questions and make comments about possible errors.

Whereas code inspection refers to peer review of any work product by trained individuals who look for defects using a well defined process

∴ (A) and (D) are also false

(C) is true

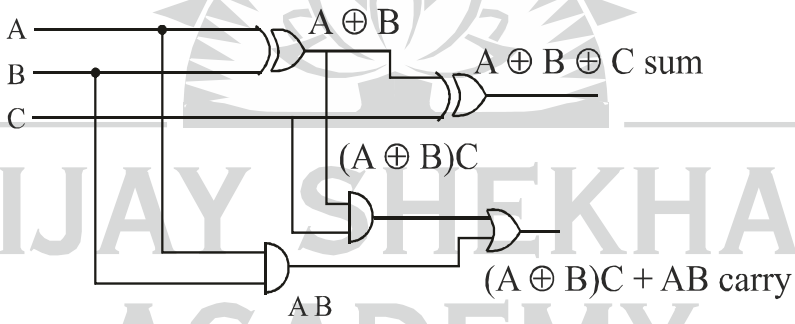
55. delay (XOR) = 2 delay (AND/OR)

= 2 × 1.2

= 2.4 usec

delay (AND) = delay (OR) = 1.2 usec

for a 4 bit ripple carry adder, we have 4 full adders



∴ worst case delay = 2 XOR gate delays OR

1 XOR delay + 1AND + 1 OR delay

= 2.4 + 1.2 + 1.2 = 4.8 usec

∴ for 4 full adders, total delay = 4.8 × 4 = 19.2 usec

∴ 19.2 usec is the answer

GENRAL APTITUDE SECTION

1. (C)

2. Personnel – the people who work for a particular company or organization

∴ only (C) is correct

In rest of the options, the word should be 'personal'

3. (D) apparel is the word used for clothing items

4. (I) $\frac{1}{4}w = 5$ kg

$\therefore$ w = 20 kg

$\therefore$ Total wt of 10 poles = 200 kg

(II) 2W + 160 = 10W

$\therefore$ 8W = 160

w = 20 kg

Total wt of 10 poles = 200 kg

$\therefore$ (C) is correct

5. $f(x) = 1 - |x|; -1 \leq x \leq 1$

$f(x)$ will be maximum when $|x| = 0$

i.e. at x = 0 and f (0) = 1

$\therefore$ (C) is correct

6. (A) is correct, rest all are grammatically incorrect

7. Area (ΔPQR) = A(ΔPQS) + A(ΔPSR)

Area (ΔPQS) $= \frac{1}{2}$ PQ . PS sin $\angle QPS$

$= \frac{1}{2} . r. PS . \frac{\sqrt{3}}{2}$ ..... (1)

Area (ΔPSR) $= \frac{1}{2} \times PR \times PS \sin \angle SPR$

$= \frac{1}{2} . q. PS \frac{\sqrt{3}}{2}$ .....(2)

$\therefore$ Area (ΔPQR) $= \frac{1}{2}$ PQ . PR sin $\angle QPR$

$= \frac{1}{2} . r .q \sin (120°)$ .....(3)

$\therefore$ (3) = (1) + (2)

$\frac{1}{2}$ qr sin (120°) = $\frac{1}{2}$.r.PS $\frac{\sqrt{3}}{2}$ + $\frac{1}{2}$ q. PS $\frac{\sqrt{3}}{2}$

$\frac{1}{2}qr\frac{\sqrt{3}}{2} = \frac{1}{2}\cdot\frac{\sqrt{3}}{2}$. PS (q + r)

$\therefore$ PS $= \dfrac{qr}{q+r}$

$\therefore$ (B) is correct

In the given question $\angle QPR = \angle QPS = 60°$ is given which is not possible.

So we've solved the problem taking $\angle SPR = 60°$ and $\angle QPR = 120°$.

8. fg (h(2, 5, 7, 3), 4, 6, 8)

h (2, 5, 7, 3) = (7 × 3) % (2 × 5) = 21 % 10 = 1

$\therefore$ fg (1, 4, 6, 8)

= f(1, 4, 6, 8) × g(1, 4, 6, 8)

= max(1, 4, 6, 8) × min (1, 4, 6, 8)

= 8 × 1

= 8

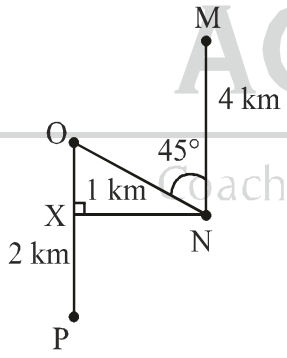
$\therefore$ 8 is the answer

9. Adding or subtracting a constant value from A.P. renders the sequence as A.P. Also multipling each term in an A.P. by a constant renders the AP.

$\therefore$ I and II are correct.

$\therefore$ (B) is correct

10.



$\therefore$ OX = 1 cos 45° = $\dfrac{1}{\sqrt{2}}$

$\therefore$ distance b/w P and M = $2 - \dfrac{1}{\sqrt{2}} + 4$

= 5.29

(A) is the closest option.