GATE

Subject : CS 2014_Set-1 - SOLUTIONS

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

1. "Not all that glitters is gold".
i.e there exists something that glitters and is not gold.

$$\exists x \text{ glitters}(x) \wedge \neg \text{gold}(x)$$

(D) is correct.

2. Expected length of shorter stick=

$$E(f(x)) = \int_0^1 f(x)dx$$

$$= \int_0^{0.5} x dx + \int_{0.5}^{1} (1-x)dx$$

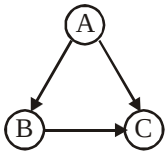
$$= \left[\frac{x^2}{2}\right]_0^{0.5} + \left[x - \frac{x^2}{2}\right]_{0.5}^{1}$$

$$= \frac{1}{4}$$

$$= 0.25$$

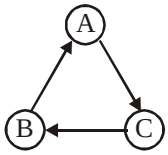
Correct range of answer is 0.24 to 0.27

3. (B) will have the same strongly connected components. Consider the following graph G: Now, as per option(B)



It has one strongly connected component

G_2 =



$\therefore$ G_2 also has one strongly connected component.

4. $\begin{bmatrix} 3 & 2 & 0 \\ 4 & 0 & 7 \\ 1 & 1 & 1 \\ 1 & -2 & 7 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 3 \\ 0 \end{bmatrix}$

Let $[A : B] = \begin{bmatrix} 3 & 2 & 0 & 1 \\ 4 & 0 & 7 & 1 \\ 1 & 1 & 1 & 3 \\ 1 & -2 & 7 & 0 \end{bmatrix}$

$R_2 \to R_2 - R_1$

$\therefore \quad [A : B] \sim \begin{bmatrix} 3 & 2 & 0 & 1 \\ 1 & -2 & 7 & 0 \\ 1 & 1 & 1 & 3 \\ 1 & -2 & 7 & 0 \end{bmatrix}$

$R_2 \to R_2 - R_1$

$\therefore \quad [A : B] \sim \begin{bmatrix} 3 & 2 & 0 & 1 \\ 1 & -2 & 7 & 0 \\ 1 & 1 & 1 & 3 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

$\therefore$ Rank (A) = Rank(A : B) = 3 = no. of unknowns

$\therefore$ The system has a unique solution

1 is the answer.

5. The eigen vectors corresponding to different eigen values of a real symmetric matrix are orthogonal to each other. And hence, their dot product is zero.

$\therefore$ 0 is the answer.

6. $f(\theta) = \begin{bmatrix} \sin\theta & \cos\theta & \tan\theta \\ \sin(\pi/6) & \cos(\pi/6) & \tan(\pi/6) \\ \sin(\pi/6) & \cos(\pi/3) & \tan(\pi/3) \end{bmatrix}$

$\theta = [\pi/6, \pi/3]$

$f(\pi/6) = f(\pi/3)$

and f is continuous and differentiable in the interval $[\pi/6, \pi/3]$

$\therefore$ By Rolle's theorem,

Statement (I) is true.

Statement(II) is also true as there will exist some $\theta \in (\pi/6, \pi/3)$ s.t. $f'(\theta) \neq 0$.

(C) is the answer.

7. F(P, Q, R, S)

$$= PQ + \bar{P}QR + \bar{P}Q\bar{R}S$$

$$= Q(P + \bar{P}R + \bar{P}\bar{R}S)$$

$$= Q(P + R + \bar{P}\bar{R}S) \qquad (\because A + \bar{A}B = A + B)$$

$$= Q(R + P + \bar{P}\bar{R}S)$$

$$= Q(R + P + \bar{R}S)$$

$$= Q(P + R + S)$$

$$= PQ + QR + QS$$

$\therefore$ (A) is correct.

8. Let the base be 'r'

$$\therefore \quad \frac{(312)_r}{(20)_r} = (13.1)_r$$

$$(312)_r = (20)_r . (13.1)_r$$

$$3r^2 + r + 2 = 2r + 0\left(r + 3 + \frac{1}{r}\right)$$

$$\therefore \quad 3r^2 + r + 2 = 2r^2 + 6r + 2$$

$$r^2 - 5r = 0$$

$$\therefore \quad r(r - 5) = 0$$

$\therefore$ r = 0 or r = 5

But base of a number is a positive integer

$\therefore$ 5 is the answer.

9. Instruction format is

opcode	Reg 1	Reg 2	Immediate operand
6	6	6	

opcode bits = $\lceil \log_2 45 \rceil$

bits for register = $\lceil \log_2 64 \rceil = 6$

$\therefore$ bits for immediate operand = 32 – (6 + 6 + 6) = 14.

If immediate operand is an unsigned integer, its range will be $[0 - (2^{14} - 1)]$

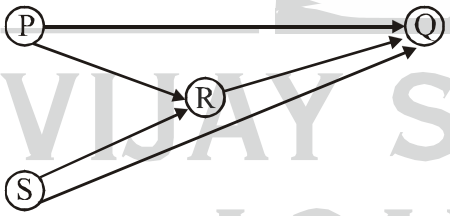
$\therefore$ Maximum value of immediate operand = $2^{14} - 1 = 16383$

10. The given code will compile and the value printed is 5 more than the integer value entered.
    ∴ (D)

11. Using adjacency matrix,
    DFS takes T.C. = $O(n^2) = O(V^2)$
    where n – no. of vertices
    Using adjacency list,
    DFS takes T.C. = O(m + n) = O(E + V)
    ∴ (C)

12. We can find the subtree having exactly 4 nodes in O(n) time.
    Traverse the given tree from leaf to root i.e. bottom up and start printing when the node count becomes 4.
    ∴ a = 1 and b = 0
    a + 10b = 1
    1 is the answer.

13. The given graph can be redrawn as



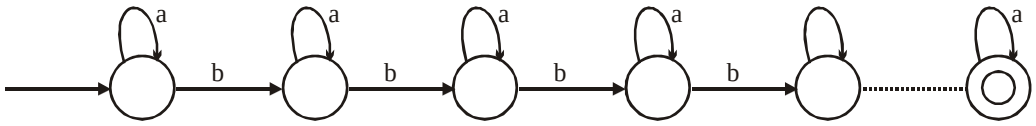
    ∴ Both PSRQ and SPRQ are topological orderings.
    ∴ (C)

14. Quick sort takes worst case time to sort when the given input is already in increasing or decreasing order.
    ∴ The input = [1 2 3 4 5] takes more time
    ∴ $t_1 > t_2$.
    (C) is correct
    NOTE: Werst case T.C. of quick sort = $O(n^2)$
    The recurrence relation is
    $$T(n) = T(n-1) + O(n)$$

15. $L = \{a^n b^n | n \geq 0\}$ is a CFL
    $L = \{a^n | n$ is prime$\}$ is recognized by a Turing machine.
    L = {w | w has 3k + 1 b's for some $k \in N$}
    over $\in$ {a, b} is a regular language
    Regular expression for L = a* b a*ba* ba*b.....

such that there are exactly (3k + 1)b's

Finite automata for L will be



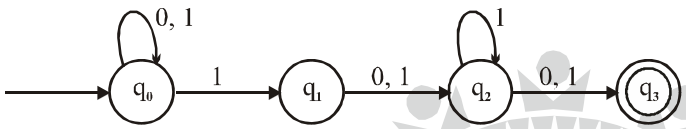
for exactly 3k + 1 b's.

L = {ww | w ∈ ∈* over ∈ = {0, 1}}

is a CSL.

It cannot be recognized by a FA.

∴ (C) is correct.

16. 

For ω = 0011

reachable states = $\{q_0, q_1, q_2\}$

q_0 0011	or	q_0 0011
q_0 011		q_0 011
q_0 11		q_0 11
q_0 1		q_1 1
q_1		q_2

∴ (A) is correct

17. A, B and C are true statements.

(D) is false. It performs folding operation and not common subexpression elimination.

∴ (D) is the answer.

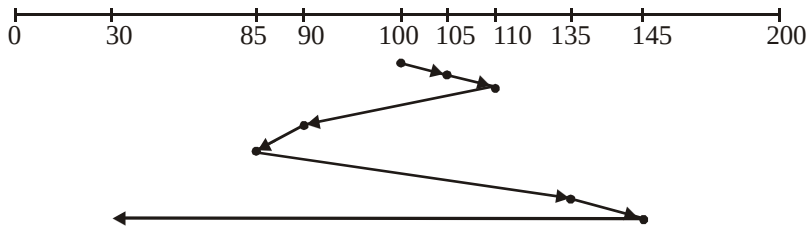
18. Waterfall model is inflexible as we cannot go a stage back.

Evolutionary model evolves at every state so it is incremental.

Risk analysis is done in spiral model. It is also more practically used model.

∴ (B) is correct.

19. Using SSTF



∴ 90 is serviced after serving 3 requests i.e. (100, 150, 110)

3 is the answer.

20. (A) is true as user level thread are implemented by user processes, whereas kernel level threads are recognized by the OS.

(B) is true as if one user level thread is performing blocking operation, then entire process will be blocked, unlike kernel level threads.

(C) is true as context switching time between user level threads is less whereas between kernel level threads, it is more.

(D) is false as both the kernel and user level threads share code and data segment.

$\therefore$ (D) is the answer.

21. (A) $(EF)^+ = EFGIJ$

$\therefore$ EF is not a key

(B) $(EFH)^+ = EFGHIJLMN$

$\therefore$ EFH is a candidate key.

(C) EFHKL is a super key

(D) $(E)^+ = E$

$\therefore$ A key is minimal of super key.

(B) is the answer.

22 S1 is false.

as foreign key declaration may have cascade delete which is not possible by just a check assertion

S2 is false.

because foreign key of one table should reference to a primary key of other table.

Primary key of R is {a, b} whereas foreign key references only to field a for R.

$\therefore$ Not a valid table definition.

(D) is the correct option.

23 S1 is true as in link state routing, every node computes its shortest path from every other node.

Hence more computational overhead.

S2 is false as split horizon avoids persistent looping in some cases but not all cases.

S3 is true as distance vector takes more time because to count of infinity problem.

$\therefore$ (D) is the answer.

24. SHA-1 and MD5 are used to generate message digests.

RSA is asymmetric public key cryptography algorithm.

DES is a symmetric key algorithm.

$\therefore$ (C) is the answer.

25. The web browser initially resolves the domain name using DNS.
Then it establishes a TCP connection with the server.
The browser then requests a webpage using HTTP and data transfer takes place.
Finally the server sends the requested page by the browser using HTTP.
$\therefore$ correct order is of option (A)

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

26. $d = 2km = 2 \times 10^3 m$
$v = 2 \times 10^8$ m/s
Token holding time = 2 μsec.
n = 10 (no. of stations)
waiting time for monitoring stations = Token holding time + Propagation time
$= (n-1)$ token holding time $+ \frac{d}{v}$
$= 9 * 2\ \mu\ sec + \frac{2\times10^3 m}{2\times10^8 m/s}$
$= 9 \times 2$ μsec $+ 10$ μsec
$= 28$ μsec.
[28 – 30] is the correct range of answer.

27. Congestion window size = 32KB
RTT = 100 msec
1 MSS = 2KB

t = 0	2 kB	slow start
t = 1	4 kB	
t = 2	8 kB	
t = 3	16 kB	Threshold reached
t = 4	18 kB	$\therefore$ congestion avoidance is started.
t = 5	20 kB	
t = 6	22 kB	
t = 7	24 kB	
t = 8	26 kB	
t = 10	30 kB	
t = 11	32 kB	

$\therefore$ 12 RTTS to get back to 32 kB congestion window.
i.e. time = 12 × 100 msec = 1200 msec.
$\therefore$ 1200 is the answer.

28. L = 1 kB

BW = 1.5 Mbps

P_t = 50 msec

L(u) = 60%

$$L(u) = \frac{T_t \times WS}{T_t + 2P_t} \quad .....(1)$$

$$T_t = \frac{L}{BW} = \frac{1kB}{1.5\times10^6 \text{ bps}} = \frac{1\times10^3\times8b}{1.5\times10^6 \text{ bps}} = 5.33 \text{ msec}$$

$$\therefore \quad \% L(u) = \frac{T_t \times WS}{T_t + 2P_t}\times100$$

$$60 = \frac{T_t \times WS}{T_t + 2P_t}\times100$$

$$\therefore \quad WS = \frac{0.6(T_t + 2P_t)}{T_t}$$

$$= \frac{0.6(5.33+100)}{5.33}$$

$$WS = 11.857$$

For selective repeat,

$$\text{Window size} = \frac{2^n}{2}$$

$\therefore$ 2n = 2 × 11.875

$\therefore$ $n = \log_2 \overline{|23.71|}$

$\therefore$ n = 5 bits for seq. no. field

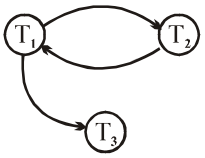
$\therefore$ 5 is the answer.

29. (A)

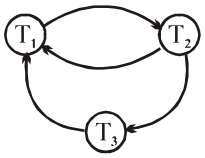
T_1	T_2	T_3
R(X)		
	R(X)	
W(X)		
		R(X)
	W(X)	

(B)

T_1	T_2	T_3
	R(X)	
R(X)		
	W(X)	
		R(X)
W(X)		



Cycle $\Rightarrow$ Not conflict serializable



Cycle $\Rightarrow$ Not conflict serializable

(C)

S

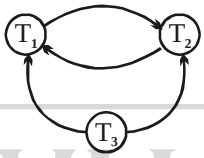
T_1	T_2	T_3
		R(X)
	R(X)	
R(X)		
	W(X)	
W(X)		

(D)

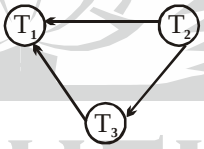
S

T_1	T_2	T_3
	R(X)	
	W(X)	
		R(X)
R(X)		
W(X)		

It is already in serialized manner



Cycle $\Rightarrow$ Note conflict serializable



It is not a direct cycle

$\therefore$ (D) is correct Topological ordering $<T_2, T_3, T_1>$ gives the serializability order.

30. S1 is true as every table with two single valued attributes is always in BCNF.

S2:

Let $f = \{AB \rightarrow C, D \rightarrow E, E \rightarrow C\}$ and

$g = \{AB \rightarrow C, D \rightarrow E, AB \rightarrow E, E \rightarrow C\}$

For f cover g:

$(AB)^+ = CAB$

$(D)^+ = DE$

$(AB)^+ = ABC$

For g cover f:

$(AB)^+ = CAB$

$(D)^+ = DE$

$(E)^+ = C$

$\therefore$ E is not functionally determined by AB in f

$\therefore$ f cover g is false and g cover f is true

$\therefore$ $f \neq g$

(A) is the answer.

31. Available (X, Y, Z) = (3, 2, 2)

	Allocation			Max		
P_0	X	Y	Z	X	Y	Z
P_1	0	0	1	8	4	3
P_2	3	2	0	6	2	0
	2	1	0	3	3	3

The system is currently in safe state.

Now, if REQ1 is permitted, then i.e. P0(0, 0, 2)

Available (X, Y, Z) = (3, 2, 0). with current availability,

	Allocation			Max			Need (Max – Allocation)		
P_0	X	Y	Z	X	Y	Z	X	Y	Z
P_1	0	0	3	8	4	3	8	4	0
P_2	3	2	0	6	2	0	3	0	0
	2	1	1	3	3	3	1	2	2

We can service need of P1

∴ Available (X, Y, Z) = (6, 4, 0)

But we can neither service request of P0 or P2.

∴ REQ1 cannot be permitted.

If REQ2 is permitted, i.e. P1(2, 0, 0) then

Available (X, Y, Z) = (1, 2, 2)

with current availability,

	Allocation			Max			Need (Max – Allocation)		
P_0	X	Y	Z	X	Y	Z	X	Y	Z
P_1	0	0	1	8	4	3	8	4	0
P_2	5	2	0	6	2	0	1	0	0
	2	1	1	3	3	3	1	2	2

We can service need of P1

∴ Available (X, Y, Z) = (6, 4, 2) we can also serve the need of P2

∴ Available (X, Y, Z) = (8, 5, 3)

Now, we can also serve the need of P0

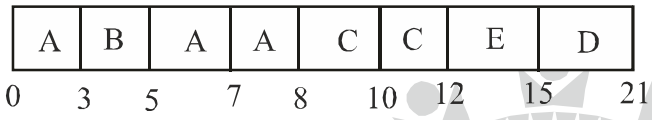
∴ Only request 2 will be permitted

∴ (B) is the answer.

32.

Process	A.T.	B.T.	C.T.	T.AT	(CT – AT)
A	0	6	8	8	
B	3	2	5	2	
C	5	4	12	7	
D	7	6	21	14	
E	10	3	15	5	
			Total	36	

Using SRTF,



$\therefore$ Average TAT = $\frac{36}{5}$ = 7.2 msec

$\therefore$ 7.2 is the answer.

33. Using optimal page replacement policy, replace that page which will not be used for longest period of time.

No. of page frames = 3

1	2	3	4	2	1	5	3	2	4	6
1	1	1	1	1	1	5	3	3	3	3
	2	2	2	2	2	2	2	2	2	6
		3	4	4	4	4	4	4	4	4
				H	H			H	H	

$\therefore$ Page faults = 11 – 4 = 7

7 is the answer.

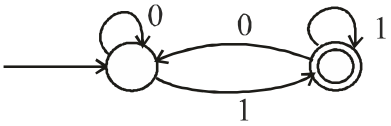
34.

Sol : The given grammar rules do not have the symbol '<' but has '>'

$\therefore$ Neither a shift reduce nor a reduce conflict.

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

35. (A) is true as if L is non recursively enumerable then $\overline{L}$ is also non recursively enumerable.
(B) is true as recursively enumerable languages are not closed under complementation.
(C) is false because if L is r.e. then $\overline{L}$ may or may not be r.e.
(D) is true. Recursive language are closed under complementation.
$\therefore$ (C) is the answer.

36. 

L = {1, 11, 01, 001, 11001,.....}
(I) & (III) accept the same language as L whereas (II) doesn't accept strings of the form 0101.
$\therefore$ (B) is correct.

37.	1	2	3	4	5	Total coins
# coins	1	2	4	8	16	= 31

Let 10 gm coins be x and 11gm coins be y
$x + y = 31$ .....(1)
Also $10x + 11y = 323$ .....(2)
Multiply eqn(1) by 10
$10x + 10y = 310$
$10x + 11y = 323$
on solving the above equations,
$\therefore$ $y = 13$ and $x = 18$
11gm coins are 13 in number.
i.e. bags 3, 4 and 1 have 11gm coins as all the coins in a bag are of same weight.
$\therefore$ Product of labels of bags having 11gm coins
$= 1 \times 3 \times 4$
$= 12$
$\therefore$ 12 is the answer.

38. Finding largest clique in a graph is an NP complete problem.
If an NP complete problem can be solved in polynomial time, then all the NP problems can be solved in polynomial time
$\therefore$ P = NP = NPC
(D) is the answer.

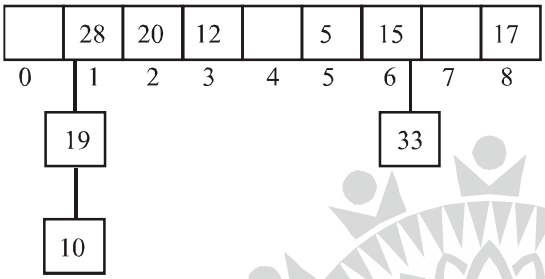
39. Using divide an conquer, the minimum no. of comparisons to find maximum of n and minimum of 'n' numbers is

$$\frac{3n}{2} - 2$$

$\therefore$ For n = 100, $\frac{3(100)}{2} - 2 = 148$

148 is the answer.

40. Hash table =



h(k) = k%9
h(5) = 5%9 = 5
h(28) = 28%9 = 1
h(19) = 19%9 = 1 \ collision
h(15) = 15% 9 = 6
h(20) = 20% 9 = 2
h(33) = 33%9 = 6 \ collision
h(12) = 12%9 = 3
h(17) = 17% 9 = 8
h(10) = 10% 9 = 1

Maximum chain length = 3 (28 – 19 – 10)
Minimum chain length = 0 (unfilled slots)

Average chain length = $\frac{0+3+1+1+0+2+1+0+1}{\#\text{slots}}$

$= \frac{9}{9}$

$= 1$

$\therefore$ (A) is correct.

41. Z is used to store the current sum and Y is used to store the maximum sum by far.
If Z > Y, then Y(Maximum sum) = Z(current sum).
i.e. the function returns the maximum possible sum of elements in any sub array of array E.
$\therefore$ (A) is the answer.

42. D = 2
for i = 1 to n do
for j = i to n do
for k = j + 1 to n do
D = D * 3
let n = 3
i = 1
j = 1 k = 2 – D = D*3 j = 2 k = 3 – D = D*3 j = 3
k = 3 – D = D * 3 –
i = 2
j = 2 k = 2 – D = D * 3 j = 3 –

i = 3
j = 3 k = 4 –
∴ No. of multiplications = 4
Now, for n = 4

i = 1
j = 1 k = 2 D = D*3 j = 2 k = 3 D = D*3 j = 3 k = 4
k = 3 D = D*3 k = 4 D = D*3 D = D*3
k = 4 D = D*3
For j = 4, k = 5 —

i = 2
j = 2 k = 3 D = D*3 j = 3 k = 4 D = D*3 j = 4, k = 5 —
k = 4 D = D*3

i = 3
j = 3 k = 4 D = D*3 j = 4, k = 5 —
∴ No. of multiplications = 10

n	# multiplications	Analysis
3	4	$\frac{1}{6}(2)(3)(4)$
4	10	$\frac{1}{6}(3)(4)(5)$

∴ (C) is the correct option.

43. For a perfectly balanced pipeline with 6 stages

$$\text{speed up of pipeline} = \frac{k(\text{no. of stages})}{1+\text{no. of stall cycles}}$$

$$= \frac{6}{1+0.25\times 2}$$

$$= \frac{6}{1.5}$$

$$= 4$$

$\therefore$ 4 is the answer.

44. $\text{Miss ratio} = \dfrac{\text{Cache misses}}{\text{Total requests}}$

We have total N cache blocks and 'n' unique block addresses. For every unique address, there will be one cache miss, when the block enters the chace for the first time.

$\therefore$ $\text{Miss ratio} = \dfrac{n}{N}$

(A) is the answer.

45. $F = \bar{P}\bar{Q}(0) + \bar{P}Q(1) + P\bar{Q}R + PQ\bar{R}$

$F = \bar{P}Q + P\bar{Q}R + PQ\bar{R}$

$= Q(\bar{P} + P\bar{R}) + P\bar{Q}R \qquad (\because A + \bar{A}B = A + B)$

$= Q(\bar{P} + \bar{R}) + P\bar{Q}R$

$\therefore$ $F = \bar{P}Q + \bar{R}Q + P\bar{Q}R$

(A) is the correct option.

46. $f(x) = x \sin x$

$f'(x) = \sin x + x\cos x$

$f''(x) = \cos x + \cos x + x(-\sin x)$

$f''(x) = 2\cos x - x\sin x$

$\therefore$ $f''(x) + f(x) + t\cos x = 0$

$2\cos x - x\sin x + x\sin x + t\cos x = 0$

$\therefore$ $t\cos x = -2\cos x$

$\therefore$ $t = -2$

-2 is the answer.

47. f(x) is continuous in the interval [0, 2]

$f(0) = f(2) = -1$

$f(1) = 1$

(A) $\exists\, y \in (0, 1)$ such that $f(y) = f(y + 1)$

let $g(y) = f(y) - f(y + 1)$

$\therefore\ g(0) = f(0) - f(1)$

$\therefore\ g(0) = -2$

$g(1) = f(1) - f(2)$

$= 1 - (-1)$

$\therefore\ g(1) = 2$

Now, $g(0).\ g(1) < 0 \quad (2 \times (-2) = -4)$

$\therefore$ g(0) and g(1) have opposite signs

$\therefore\ \exists$ atleast one $C \in (0, 1)$

such that $g(c) = 0$

$\therefore\ f(c) - f(c + 1) = 0$

i.e. $f(c) = f(c + 1)$

$\therefore\ f(y) = f(y + 1)$

$\therefore$ (A) is true.

$\therefore$ We do not need to check rest of the options.

48. Sum = 22 when four fair sided dice are rolled

Case I: $(6, 6, 6, 4) = \frac{4!}{3!} = 4$

Case II: $(6, 6, 5, 5) = \frac{4!}{2!2!} = \frac{24}{4} = 6$

No other case is possible

Total cases = $6^4 = 1296$

$\therefore$ Probability (sum = 22) = $\frac{6+4}{1296} = \frac{10}{1296}$

$\therefore$ X = 10 is the answer

49. Let pennant of a number 'n' be denoted as P(n)

$P(1) = \{(1)\} = \#1$

$P(2) = \{(1, 1), (2)\} = \#2$

$P(3) = \{(1, 1, 1), (1, 2), (2, 1)\} = \#3$

$P(4) = \{(1, 1, 1, 1), (1, 1, 2), (1, 2, 1), (2, 1, 1), (2, 2)\} = \#5$

$\therefore$ P(n) forms a Fibonacci series 1, 2, 3, 5.....

P(10) = 10th term of the series starting from 1

1, 2, 3, 5, 8, 13, 21, 34, 55, 89

$\therefore\ P(10) = 89$

89 is the correct answer.

50. f: $\{0, 1\}^4 \rightarrow \{0, 1\}$

$\therefore$ no. of functions in S = 2^{16}

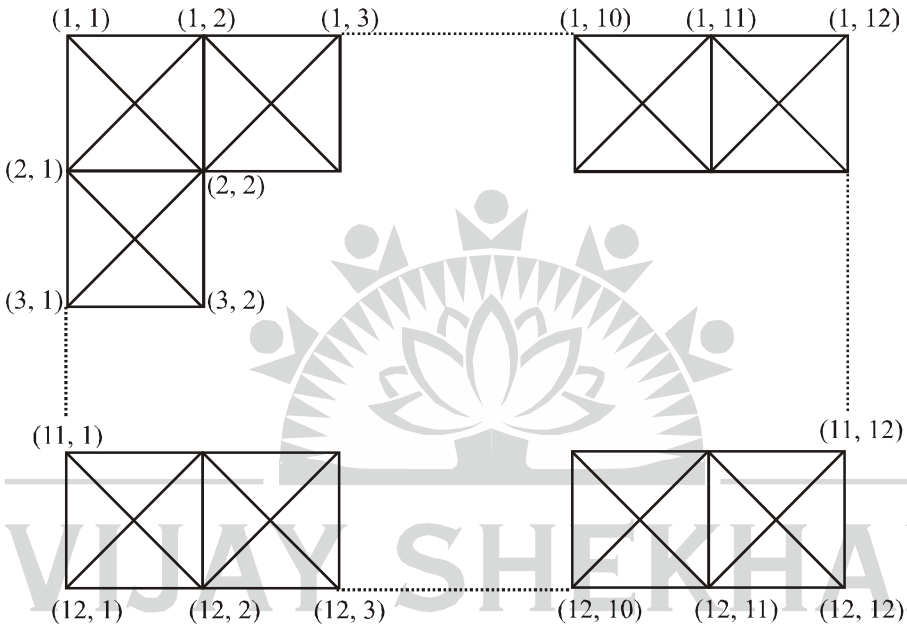
no. of functions in N = all functions from S to the set {0, 1}

$= 2^{2^{16}}$

$\therefore$ $\log_2\log_2 N = \log_2\log_2 2^{2^{16}} = 16$

$\therefore$ 16 is the answer.

51.



(i) Horizontal edges = 11 * 12 = 132

(1, 1) — (1, 2) — .....(1, 12) — 11 edges

(2, 1) — (2, 2) — .....(2, 12)

(ii) Vertical edges = 11 * 12 = 132

(1, 1) (1, 2) (1, 3)..... (1, 12)

| | | |

(2, 1) (2, 2) (2, 3) (2, 12)

⋮ ⋮ ⋮ ⋮

(12, 1) (12, 2) (12, 3) (12, 12)

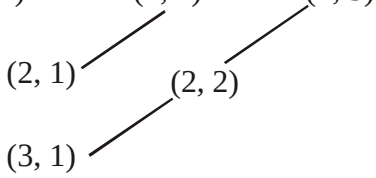
(iii) Diagonal edges = 121 + 121 = 242

Case I: (1, 1) (1, 1)

(2, 1) (2, 3)

(12, 12) (11, 12)

Case II: (1, 1) (1, 2) (1, 3)



$\therefore$ Total edges = 132 + 132 + 121 + 121 = 506

506 is the answer.

52. (A) (1, 1, 1, 1, 1, 1)

It is already has even no. of 1s

$\therefore$ Graphic

(B) (2, 2, 2, 2, 2)

= 1 1 2 2 2

= 2 2 1 1

= (1 1 1 1) = even 1s

$\therefore$ Graphic

(C) (3, 3, 1, 0, 0)

2, 1 0 0

(1 0 0 0) = odd 1s

$\therefore$ Not a graph

(D) (2, 1, 1, 1, 0)

= 1 0 0 1 0

= (1 1 0 0 0) = even 1s

$\therefore$ graphic

(C) is the answer.

53. In option (A)

$((p \leftrightarrow q) \wedge r) \vee (p \wedge q \wedge \neg r)$

= $[(\neg p \wedge \neg q) \vee (p \wedge q)) \wedge r] \vee (p \wedge q \wedge \neg r)$

If we assume q and r to be true, we get the above expression as false.

In option (B)

$(\sim (p \leftrightarrow q) \wedge r) \vee (p \wedge q \wedge \sim r)$

= $[((\neg p \wedge q) \vee (\neg q \wedge p)) \wedge r) \vee (p \wedge q \wedge \neg r)$

If we assume either of pq, qr and pr (i.e. exactly two of p, q, r) to be true, the above propositional logic formula evaluates to true.

$\therefore$ (B) is correct.

54. (B) is the answer.

The given query is correct and it executes and gives correct result.

It returns the max(hire-date) in every department in location id = 1700 and groups them by department id.

55.

	Time	CPI	Clock frequency
P_1	T	X	1 GHz
P_2	3/4 T	6/5X	?

For P1, let there be 100 instructions

$$T = CPI * CT * IC \text{ (instruction count)}$$

$$T = X . \quad 1. \quad 100$$

$$\therefore \quad T = 100X \qquad \text{.....(1)}$$

For P_2, let there be 100 instructions

$$\frac{3}{4}T = CPI * C.T. * IC$$

$$\frac{3}{4}T = \frac{6}{5}X. CT * 100$$

$$\therefore \quad CT = \frac{3}{4}T * \frac{5}{6X}.\frac{1}{100}$$

$$CT = \frac{3}{4} * 100X.\frac{5}{6X}.\frac{1}{100} \qquad \text{(from (1))}$$

$$CT = \frac{15}{24}\text{nsec}$$

$\therefore$ Clock frequency of $P_2 = \frac{1}{CT} = \frac{24}{15}\times 10^9 = 1.6$ GHz

$\therefore$ 1.6 is the correct answer.

GENRAL APTITUDE SECTION

1. cope with – adapt to

(B) is the correct answer.

2. (C) mediocre – average

3. The phrase means ‘he will assume final responsibility’

(C) is the correct answer.

4. $\left(Z+\frac{1}{Z}\right)^2 = 98$

$Z^2 + 2.Z.\frac{1}{2} + \frac{1}{Z^2} = 98$

$\therefore\ Z^2 + \frac{1}{2} = 96$

96 is the answer

5. ax^2 b $|x| + c = 0$

when $x > 0$,

$ax^2 + bx + c = 0$ _____ real and positive roots (given)

when $x < 0$,

$ax^2 - bx + c = 0$ _____ roots will be real and negative

$\therefore$ 4 distinct roots

(D) is the answer

6. Only (C) can be inferred from the given passage.

(A) is false because it is given that exact reasons for the formation of this gap are unclear.

(B) is false because the passage does not mention about low lying areas.

(D) is false as it can only be concluded that neighbouring regions of kerela have higher summer temperature and neighbouring regions of Tamil Nadu get more rainfall.

7. (A) is false because geneticists are very close to confirming the roots of psychiatric illnesses.

Thus it implies that yet the strategies are not available.

(B) is true

(C) is false as 'all' human diseases cannot be traced back to genes.

(D) is false because it says in future, gentics will be the 'only' relevant field for identifying such illnesses.

$\therefore$ (B) is the answer

8. For a group of 5,

Total fare = 5 × 100 × 2 = 1000

discount = 10% of 1000 = 100

Also they will be eligible for discount of 5% on total fare as they are a group of 5

$\therefore$ Additional discount = 5% of 1000 = 50

Total round tripcharge (for 5 people)

= 1000 – 100 – 50

= 850

$\therefore$ 850 is the answer

9.

	Men	Women
Car	40 ✓	34 ✓
Scooter	30	20
Both	60	46
No. vehicle	20 ✓	50 ✓
Total	150	150

No. of people who do not own a scooter

= 40 + 20 + 34 + 50

= 144

$$\% \quad \frac{144}{150+150} \times 100 = 48$$

$\therefore$ 48 is the answer

10. To form an internal plane, inside a tetrahedron, we need to connect the point inside it to exactly two corners.

A tetra-hedron has 4 corners.

So exactly corners can be chosen in $4C_2$ ways = 6

$\therefore$ 6 internal planes will be created

6 is the answer