GATE

Subject : CS 2015_Set-3 - SOLUTIONS

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

1. char S1 =

1	2	3	4	\0	\0	\0
0	1	2	3	4	5	6

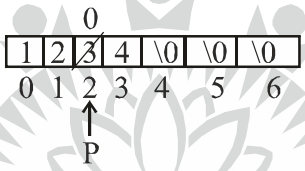
For a character array, if the array has less number of elements than its specified size, then rest of the character are initialized to '\0' NULL character unlike in an integer array, they are initialized to 0 by default

P = S1 + 2

*P = 0

∴ S1 = 1204

(C) is correct



2. S = {1, 2, 3, 4, 5, 6} ∴ |S| = 6

U = Power set (S)

$|U| = 2^6 = 64$

Let X ∈ U

X = {1, 2} ∴ $|\overline{X}| = 2^6 - 2 = 62$

|X| = 2

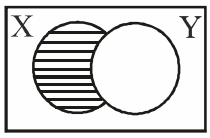
∴ (A) is false

(B) is false. It is not always true

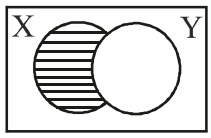
(C) is false as X\Y = ϕ is not always true

for ∀X ∈ U and ∀Y ∈ U

(D)



X\Y



Y'\X'

∴ X\Y = Y'\X'

(D) is correct

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3. For a trivial functional dependency $X \rightarrow Y$ means $X \supseteq Y$

   (A), (B) and (D) are not trivial

   $\{P, S\} \rightarrow \{S\}$

   $\{P,S\} \supseteq \{P,S\}$

   $\therefore$ $\{P, S\} \rightarrow \{S\}$ is trivial

   $\therefore$ (C) is true.

4. The maximum number of processes that can be in ready state for a computer with 'n' CPUs is independent of n

   (D) is correct.

5. Simple LR parser is very easy to implement. Canonical LR parser is the most powerful. But disadvantage is that it requires a lot of handwork for implementation.

   (C) is correct.

6. $X \# Y = \overline{X} + \overline{Y}$

   (S1) $(P \# Q) \# R$ ------- LHS

   $= (\overline{P} + \overline{Q}) \# R$

   $= \overline{\overline{P} + \overline{Q}} + R$

   $= PQ + \overline{R}$

   RHS $= P \# (Q \# R)$

   $= P \# (\overline{Q} + \overline{R})$

   $= \overline{P} + \overline{\overline{Q} + \overline{R}}$

   $= \overline{P} + QR$

   $\therefore$ L.H.S. $\neq$ RHS

   $\therefore$ S1 is false

   (S2) LHS $= Q \# R$

   $= \overline{Q} + \overline{R}$

   RHS $= R \# Q = \overline{R} + \overline{Q}$

   LHS = RHS

   $\therefore$ S2 is true

   (B) is correct

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7. Function point metric = UPF × VAF

UPF = unadjusted function point (UFP) count

VAF – Value Adjustment factor

UPF = 4 × 30 + 60 × 5 + 23 × 4 + 8 × 10 + 7 × 2

= 606

VAF = (degree of influence × 0.01) + 0.65

Degree of influence = 3 × 4 + 0 × 4 + 4 × 6

= 36

VAF = (DI × 0.01) + 0.65

= 0.36 + 0.65

= 1.01

$\therefore$ FP = 606 × 1.01

= 612.06

$\therefore$ 612.06 is the answer.

8. The <base> tag in HTML specifies the base URL/target for all relative URLs in a document. There can be maximum one <base> element in a document and it must be inside the <head> element.

(B) is the answer.

9. (I) Is true as in TCP, sender and receiver can send data at the same time.

(II) Is false as TCP has option for selective acknowledgements to inform the sender about which segments have arrived successfully and which segments need to be retransmitted.

(III) Is false as TCP, data is in the form of segments and sequence number is associated with each byte in TCP.

$\therefore$ (A) is correct.

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10. $\sum_{i=0}^{n} i^3 = \left[\frac{n(n+1)}{2}\right]^2 = \left(\frac{n^2+n}{2}\right)^2$

$= O(n^4)$

$\therefore f(n) = \frac{1}{2}(n^4 + 2n^3 + n^2)$

$f(n) = \theta(n^4)$ as

$C_1 . n^4 \leq n^4 \leq C_2 n^4$

where C_1 and C_2 are constancts.

$\therefore$ (I) is correct

(II) is false as $f(n) \neq \theta(n^5)$

$\because f(n) \neq \Omega(n^5)$

i.e. $f(n) \geq C.\ n^5$ does not satisfy

(III) is correct

as $f(n) \leq C.\ n^5$ for $C = 1$

$f(n) = O(n^5)$

(IV) is correct

as $f(n) \geq C.\ n^3$ for $C = 1$

$\therefore\ f(n) = \Omega\ (n^3)$

(C) is the correct option

11. Leaf nodes = External nodes = 200

Nodes having 2 children = Internal nodes

$E = I + 1$ ——— . for a binary tree

$\therefore\ I = E - 1 = 200 - 1 = 199$

$\therefore$ 199 is the answer

12. # elements = 2000

slots = 25

Load factor (α) for hash table = $\dfrac{\#\ \text{elements}}{\#\ \text{slots}}$

$= \dfrac{2000}{25}$

$= 80$

$\therefore$ 80 is the answer

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13. $A = \begin{bmatrix} 1 & -1 & 2 \\ 0 & 1 & 0 \\ 1 & 2 & 1 \end{bmatrix}$

we know, $|A - \lambda I| = 0$

and $\lambda = 1$, is given

for an eigen vector X, $\boxed{AX = \lambda X}$ $\quad\therefore\ (A - \lambda)\ X = 0$

$$\therefore \begin{bmatrix} 0 & -1 & 2 \\ 0 & 0 & 0 \\ 1 & 2 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

$-x_2 + 2x_3 = 0$

$x_1 + 2x_2 = 0$

$x_1 = -2x_2$

Let $x_3 = t$

$\therefore\ x_2 = 2x_3 = 2t$

$x_1 = -2x_2$

$= -2(2t)$

$= -4t$

$$\therefore \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} -4t \\ 2t \\ t \end{bmatrix} = \begin{bmatrix} -4 \\ 2 \\ 1 \end{bmatrix} = \begin{bmatrix} -4 \\ 2 \\ 1 \end{bmatrix} = X$$

$\therefore$ (B) is correct

14. $\lim\limits_{x\to\infty} e^{-x}(1+x^2)$

$= \lim\limits_{x\to\infty} \dfrac{1+x^2}{e^x} \equiv \dfrac{\infty}{\infty}$

$\therefore$ use L Hospital's Rule,

$= \lim\limits_{x\to\infty} \dfrac{2x}{e^x}$

$= \lim\limits_{x\to\infty} \dfrac{2}{e^x} = \dfrac{\text{finite}}{\text{infinite}}$

$= 0$

$\therefore$ (A) is correct

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15. 4 digit numbers having digits from {1, 2, 3} in non decreasing order (from left to right)

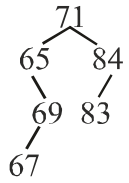
1	1	1	1	2	2	2	2
1	2	2	2	2	2	2	3
1	2	2	3	2	2	3	3
1	2	3	3	2	3	3	3
1	1	2	3	3	3	3	3
1	1	2	2				
1	1	1	2				
1	1	1	3				
1	1	3	3				
1	3	3	3				

$\therefore$ Total 15 numbers.

15 is the answer

16. The result of the toss is head in both cases. For type I, the person always tells the truth
$\therefore$ Result is head
For Type II, the person always tells a lie i.e. negation of given statement
$\neg(p \leftrightarrow q) \equiv \bar{p}q + p\bar{q}$
$\therefore$ Either toss is head and he is not telling truth
or toss is tail and he is telling the truth
But we know Type II people always lie
$\therefore$ Toss is head.
(A) is the correct option

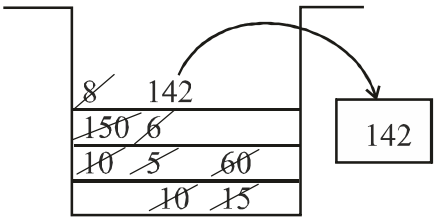
17. BST for the given elements is



$\therefore$ Element at lowest level = 67

$\therefore$ (B) is correct

18. 10 5 + 60 6 / * 8 –
scan left to right to evaluate a postfix expression
if operand $\rightarrow$ Push to the stack
if operator $\rightarrow$ t_1 = S. POP
t_2 = S. POP
E = t_2 operator t_1
S. push (E)
continue until the expression is evaluated and finally pop out the result.



$t_1 = 5$
$t_2 = 10$
$E = 10 + 5 = 15$

$t_1 = 6$
$t_2 = 60$
$\therefore E = 60 / 6 = 10$

$t_1 = 10$
$t_2 = 15$
$E = 15 \times 10 = 150$

$t_1 = 8$
$t_2 = 150$
$E = 150 - 8 = 142$

$\therefore$ 142 is the answer
(C) is the correct answer.

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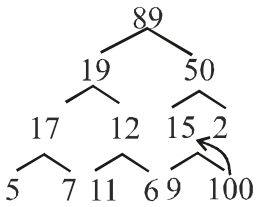
19. (A) is the correct answer

'All' gives maximum of all the arguments satisfying the condition.

'ANY' gives minimum of all the arguments satisfying the condition.

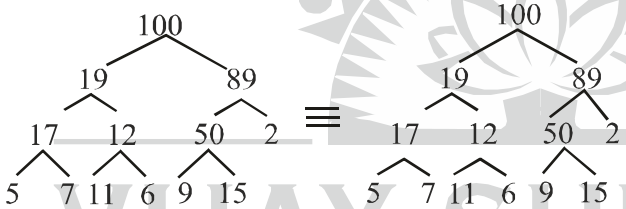
20. Only 100 is in wrong position

$\therefore$ Minimum 3 interchanges are required to convert the given array into a max-heap



$15 \leftrightarrow 100$
$100 \leftrightarrow 50$ are the required exchanges
$100 \leftrightarrow 89$

$\therefore$ Final max heap will be



$\therefore$ (D) is the correct answer

21. When both var P = var Q = True

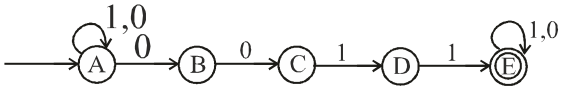
both processes X and Y enter the critical section at once.

$\therefore$ Mutual Exclusion fails

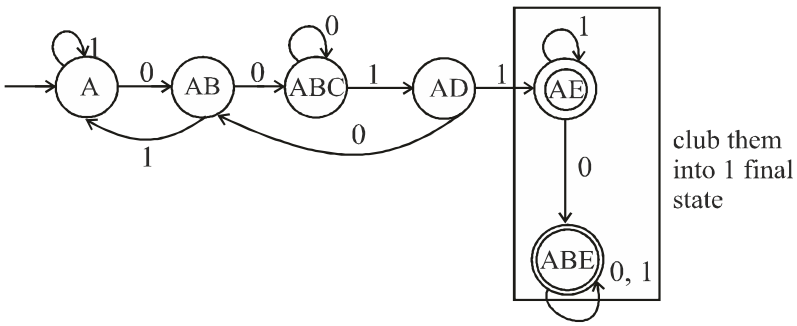
There is no deadlock as atleast one of X and Y will continue to execute

$\therefore$ (A) is correct.

22. Regular expression = (1 + 0)* 0011 (1 + 0)*



is the NFA for given R.E. DFA will be as follows for L(R.E.)



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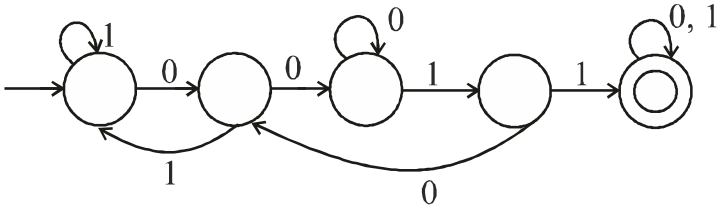
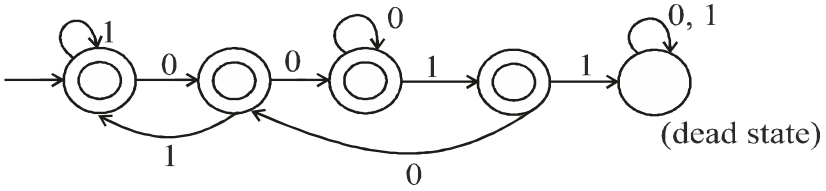
Minimized DFA for L is



For $\bar{L}$, make final state(s) as non final and non final state(s) as final state.

$\therefore$ DFA for $\bar{L}$



$\therefore$ 5 states in a DFA for $\bar{L}$

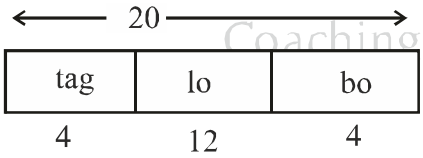
for a language L, no. of states in DFA for L and $\bar{L}$ will be equal
(B) is the answer

23. Faults detected = 159
Real faults among all detected faults
= 159 – 75
= 84

$\therefore$ Total real falults = $\frac{100}{75} \times 84 = 112$

$\therefore$ Real faults which are left undetected
= 112 – 84 = 28
$\therefore$ 28 is the answer

24. Main m/m = 2^{20} B
Using direct mapped cache,



lo – line offset, bo – block offset

Block size = 16 B = 2^4 B

$\therefore$ bo = 4 bits

lo = $\log_2$ (# lines)

= $\log_2 2^{12}$

$\therefore$ lo = 12 bits

$\therefore$ tag = 20 – (12 + 4) = 4 bits

for cache line address $(E\ 201\ F)_{16}$

$\underbrace{1110}_{\text{tag}}\ \underbrace{0010\ \ 0000\ \ 0001}_{\text{lo}}\ \underbrace{1111}_{\text{bo}}$

$\therefore$ tag = E

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lo = 201 (cache line address)

bo = F

$\therefore$ (A) is correct

25. For CSMA/CD

$\boxed{Tt \geq 2Pt}$

$$\frac{L}{BW} \geq 2.\frac{d}{v}$$

$$\therefore v \geq \frac{2.\,d.\,BW}{L}$$

$$\therefore v \geq \frac{2\times 1\,km\times 10^8\ bps}{1250\ B}$$

$$\therefore v \geq \frac{2\times 1\,km\times 10^8\ bps}{1250\ \times 8\ b}$$

$\therefore v \geq 20000$ km/sec

$\therefore$ (D) is the answer

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

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26. It starts from rest

$\therefore$ at t = 0, v = 0

	y_0	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8	y_9	y_{10}
t	0	2	4	6	8	10	12	14	16	18	20
v	0	10	18	25	29	32	20	11	5	2	0

$\therefore y_0 = 0,\ y_n = y_{10} = 0;\ h = 2$

We have to find distance $\int_0^{20} v.dt$ $\therefore$ By Simpson's $\frac{1}{3}$rd rule,

$$= \frac{h}{3}\ [y_0 + y_n + 2\ (y_2 + y_4 + y_6 + y_8 + y_{10}) + 4\ (y_1 + y_3 + y_5 + y_7 + y_9)]$$

$$= \frac{2}{3}\ [0 + 0 + 2\ (18 + 29 + 20 + 5) + 4\ (10 + 25 + 32 + 11 + 2)]$$

$$\therefore \int_0^{20} v.dt = \frac{2}{3}\ (144 + 320)$$

$$= \frac{466\times 2}{3}$$

$\therefore$ 309.33 is the answer

27. Merge sort worst case T.C. = O(n log n)

n = 64

$t = c.64 \log_2 64$

$\therefore$ $c.\ 64 \log_2 64 = 30$ secs

$\therefore$ $c = \dfrac{30}{64 \times 6}$

$\therefore$ $\boxed{c = \dfrac{5}{64}}$

t = 6 mins ——— n = ?

= 6 × 60 sec

$\therefore$ $360 \text{ sec} = \dfrac{5}{64} \cdot n \log n$

$\therefore$ n log n = 4608

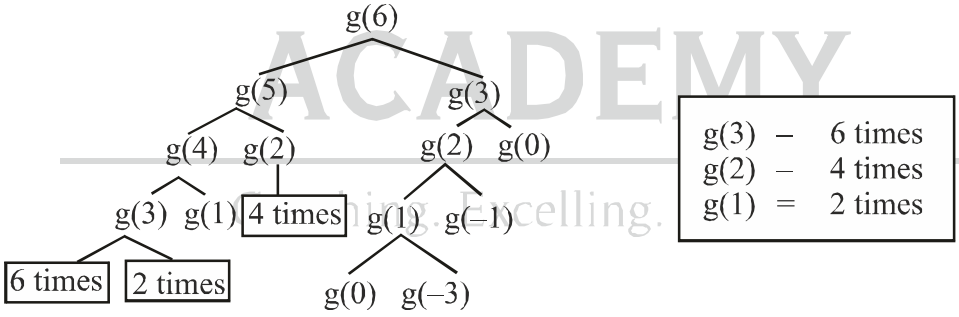
for n = 256 —— n log n = 2048

for n = 512 —— n log n = 4608

$\therefore$ n = 512

(B) is correct

28. get (6) ≡ g (6)



$\therefore$ No. of times get ( ) invoked = 6 + 2 + 4 + 13

= 25

$\therefore$ (B) is the answer

29. key = 12B

Block size (BS) = 1024 B

R_p (record pointer) 10 B

B_p (block pointer) = 8 B

Keys = order – 1

For a B + tree, 'P' be the order of internal node

$\therefore$ (P – 1) keys + $PB_p \leq BS$

(P – 1) 12B + P. 8B $\leq$ 1024 B

12 P – 12B + 8P $\leq$ 1024 B

20 P $\leq$ 1036

$\therefore P \leq \frac{1036}{20}$

P $\leq$ 51.8

$\therefore P_{max} = 51$

$\therefore$ maximmum keys = Pmax – 1

= 51 – 1

= 50

$\therefore$ 50 is the answer

30. $F = \overline{P} + QR$

$\overline{P}$ = 0$\phi\phi$ = 000, 001, 010, 011 (0, 1, 2, 3)

QR = ϕ11

= 011 or 111

= (3, 7)

$\therefore$ F = $\sum$ (0, 1, 2, 3, 7)

= π (4, 5, 6)

$\therefore$ (A) is the correct option

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31. $L_1 \leq_m L_2$ (i.e. L_1 is polynomial time reducible to L_2)

$L_3 \leq_m L_2 \leq_m L_4$

(I) If L_4 is in P, then L_2 is in P $\therefore$ true

(II) If $L_1 \in P$ or $L_3 \in P$, we cannot say if $L_2 \in P$ $\therefore$ (II) is false

(III) L1 $\in$ P ($\because L_2 \in P$)

$\therefore$ If $L_3 \in P$, then L_1 may or may not be in P $\therefore$ (III) is false

(IV) If $L_4 \in P$, then $L_2 \in P$

If $L_2 \in P$, then $L_1 \in P$ and $L_3 \in P$

$\therefore$ True

(C) is the correct option

32. x = 10; //globally

main ( )

{ x = 1

x + = f_1 ( ) + f_2 ( ) + f_3 ( ) + f_2 ( );

print f("%d", x);
}
int f_1 ( )
{ int x = 25;
x + +;
return x;
}
int f_2 ( )
{ static int x = 50;
x + + ;
return x;
}
int f_3 ( )
{ x * = 10;
return x;
}
$\therefore$ x = 1 + f_1 ( ) + f_2 ( ) + f_3 ( ) + f_2 ( )
when f_1 ( ) is called
x = 25 // local x is created
x + +; $\therefore$ x = 26
f_1 ( ) $\rightarrow$ 26
when f_2 ( ) is called for the first time static int x = 50 // initialized only once
x + +; x = $\boxed{51}$
$\therefore$ f_2 ( ) $\rightarrow$ 51
when f_3 ( ) is called
There is no variable 'x' declared
$\therefore$ we refer to global x
$\therefore$ x = 10 × 10 = 100
$\therefore$ f_3 ( ) $\rightarrow$ 100
when f_2 ( ) is called again,
x + + ; x = $\boxed{52}$
$\therefore$ f_2 ( ) $\rightarrow$ 52
$\therefore$ x = 1 + 26 + 51 + 100 + 52 = 230
$\therefore$ 230 is the answer

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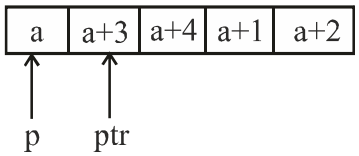
33. a =

0	1	2	3	4
10	20	30	40	50

*p[ ] =



**ptr = p

ptr = p

ptr ++;

$\therefore$ ptr – p = 1

((ptr)) = * (a + 3)

= 40

$\therefore$ output = 140

34. $L_1 = \{a^m b^n a^n b^m \mid m, n \geq 1\}$

Push a's, push b's

For each a, pop one b

For each b, pop one a

$\therefore$ L_1 is a CFL

$L_2 = \{a^m b^n a^m b^n \mid m, n \geq 1\}$

with one stack, L_2 cannnot be simulated

$\therefore$ L_2 is not a CFL

$L_3 = \{a^m b^n \mid m = 2n + 1\}$

$\therefore$ $L_3 = a^{2n+1} b^n$

i.e. relation between both a and b

$\therefore$ L_3 is a CFL

(B) is correct

35. (I) prevents hold and wait

(II) , (III) and (IV) avoid circular wait

$\therefore$ (D) is correct

36. IP address = 200.10.11.144/27

#IP addresses = $2^{32-27} = 2^5 = 32$

Last address of network = Make leftmost 5 bits as 1's

144 = 100$\underline{10000}$

$\therefore$ Last address of n/w = 10011111

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But this cannot be assigned to any host as it is a broadcast address of that n/w

$\therefore$ Last address that can be assigned to a host 10011110 = 158

$\therefore$ Last IP address of the host = 200.10.11.158/27

$\therefore$ 158 is the 4th octet value

37. d = 8000 km = 8×10^6 m

BW = 500×10^6 bps

Speed (v) = 4×10^6 m/s

L = 10^7 b

Since the n/w is to be used to its full capacity, efficiency = 100%

$$\therefore \quad n = \frac{Tt \times WS}{Tt + 2Pt} \times 100$$

$$\therefore \quad 100 = \frac{Tt \times WS}{Tt + 2Pt} \times 100$$

$\therefore$ Tt + 2Pt = WS × Tt

$$\therefore \quad WS = \frac{Tt + 2Pt}{Tt}$$

$$Tt = \frac{L}{BW} = \frac{10^7 b}{500 \times 10^6 bps} = 0.02sec = 20 \text{ msec}$$

$$Pt = \frac{d}{v} = \frac{8 \times 10^6 m}{4 \times 10^6 m/s} = 2 \text{ sec}$$

$$\therefore \quad WS = \frac{0.02 + 2(2)}{0.02} = 201$$

For Go Back–N, WS = $2^n - 1$

$\therefore$ Seq. no. = $\lceil \log_2 WS \rceil$

= $\log_2 \lceil 201 \rceil$

= $\lceil 7.65 \rceil$

= 8 bits

$\therefore$ 8 is the correct answer

38.

	1	2	3	4	5	6	7	8	9	10
S_1	X				X	X				X
S_2		X		X			X		X	
S_3			X					X		

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For S_1, latency = 4

For S_2, latency = 2

S_3 completes in one clock cycle

$\therefore$ latency = 0

$\therefore$ Average latency = $\frac{4+2}{2} = \frac{6}{2} = 3$

$\therefore$ 3 is the answer

39. S1 is false as there is no anti-dependence between I_2 and I_5. Instead there is an output dependence

S2 is true. There is anti dependence between I_2 and I_4 for register R3.

S3 is false. It does not 'always' create stalls. Stalls can be avoided by using renaming concept, i.e. renaming the instruction and data caches or renaming the overlapping stages.

$\therefore$ (B) is correct.

40. Let n = 4

code seg 1 :

Y [i] = 0 for all i

Y = | 0 | 0 | 0 | 0 |

X		0	1	2	3
	0	0	1	2	3
	1	1	2	3	4
	2	2	3	4	5
	3	3	4	5	6

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for (i = 0; i < n; i ++)

Y[i] + = X [0] [i] //accessed in row major order.

$\therefore$ Y = | 0 | 1 | 2 | 3 |

Code seg 2 :

Y[i] = 0 for all i

Y = | 0 | 0 | 0 | 0 |

X array will be same as in code seg 1.

for (i = 0; i < n; i ++)

Y [i] + = X [i][0] //accessed in coloumn major order.

$\therefore$ Y = | 0 | 1 | 2 | 3 |

S1 is true

S2 is true as in C, 2D-arrays are stored in row major order by default.

S3 is false.

$\therefore$ (C) is correct.

41. T_2 depends on T_1

W – R on data item A

$\therefore$ commit of T_2 should be delayed

until commit of T_1 to ensure recoverability

$\therefore$ The given schedule is non-recoverable.

(B) is correct

42. $$\begin{bmatrix} p & q & r \\ q & r & p \\ r & p & q \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

consider the coefficient matrix

$$\therefore A = \begin{bmatrix} p & q & r \\ q & r & p \\ r & p & q \end{bmatrix}$$

$C_1 \to C_1 + C_2 + C_3$

$$\therefore A \sim \begin{bmatrix} p+q+r & q & r \\ p+q+r & r & p \\ p+q+r & p & q \end{bmatrix}$$

$R_2 \to R_2 - R_1$

$R_3 \to R_3 - R_1$

$$\therefore A \sim \begin{bmatrix} p+q+r & q & r \\ 0 & r-q & p-r \\ 0 & p-q & q-r \end{bmatrix}$$

Since the system has non trivial solutions, it must have infinite solutions as it is a homogenous system

$\therefore |A| = 0$

$(p + q + r) [(r - q) (q - r) - (p - r) (p - q)] = 0$

$(p + q + r) [qr - r^2 - q^2 + qr - (p^2 - pq - pr + qr)] = 0$

$(p + q + r) [qr - r^2 - q^2 - p^2 + pq + pr] = 0$

$\therefore p + q + r = 0$ or $pq + qr + pr - r^2 - q^2 - p^2 = 0$

$\therefore pq + qr + pr = p^2 + q^2 + r^2$

i.e. when $p = q = r$

$\therefore$ (C) is the correct choice

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43. k = 0

j = 2 * 3/4 + 2.0/5 + 8/5

= 6/4 + 2.0/5 + 8/5

= 1 + 0 + 1

j = 2

k = k – (– –j) = 0 – (1) = –1

for i = 0

(i + k) = 0 – 1 = – 1 ——— 1 time (default case)

for i = 1

1 – 1 =0 ∴ i + k = 0 ——— 1 time (default case)

for i = 2

i + k = 2 – 1 = 1 ——— 3 times (as there is no break b/w each case, all the cases will be executed)

for i = 3

i + k = 3 – 1 = 2 ——— 3 times

for i = 4

i + k = 4 – 1 = 3 ——— 2 times

∴ No. of times, printf is executed = 1 + 1 + 3 + 3 + 2 = 10

∴ 10 is the answer

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44. af (x) bf $\left(\frac{1}{x}\right) = \frac{1}{x} - 25$ ——— (1)

Put x = $\frac{1}{x}$

∴ af $\left(\frac{1}{x}\right)$ + bf(x) = x – 25 ——— (2)

Multiply eqn (1) by a and eqn (2) by b

$a^2f(x) + abf\left(\frac{1}{x}\right) = a\left[\frac{1}{x} - 25\right]$ ——— (3)

$abf\left(\frac{1}{x}\right) + b^2f(x) = b[x - 25]$ ——— (4)

On (3) – (4), we get

$a^2f(x) - b^2f(x) = a\left(\frac{1}{x} - 25\right) - b(x - 25)$

$[a^2 - b^2](f(x)) = a\left(\frac{1}{x} - 25\right) - (x - 25)$

$$\therefore \int_1^2 f(x)dx = \frac{1}{a^2-b^2}\int_1^2 a\left(\frac{1}{x}-25\right)-b(x-25)dx$$

$$= \frac{1}{a^2-b^2}\left[a\ln x - 25ax - \frac{bx^2}{2} + 25bx\right]_1^2$$

$$= \frac{1}{a^2-b^2}\left[\left(a\ln 2 - 50a - 2b + 50b\right) - \left(-25a - \frac{b}{2} + 25b\right)\right]$$

$$= \frac{1}{a^2-b^2}\left[a\ln 2 - 25a + \frac{47b}{2}\right]$$

$$= \frac{1}{a^2-b^2}\left[a(\ln 2 - 25) + \frac{47b}{2}\right]$$

$\therefore$ (A) is the answer

45. V = 100
E = 300
Weight of MST = 500
MST has V – 1 edges $\therefore$ 99 edges
when weight of each edge is increased by 5,
MST new weight = 500 + 99 (5)
= 500 + 495
= 995
$\therefore$ 995 is the answer

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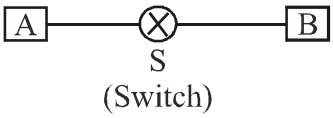
46. $BW = 10^7$ bps
Pt = 20 usec
L = 5000 b
} for each link



$$Tt = \frac{L}{BW} = \frac{5000}{10^7} = 5 \times 10^{-4} \text{ sec} = 500\ \mu\text{sec}$$

Pt = 20 μsec
Switch forwards a packet 35 μsec after it receives
$\therefore$ delay (from A to B) = 500 + 35 + 20 + 20 + 500 = 1075 μsec

2 packets need to be transmitted as 10000/5000 = 2

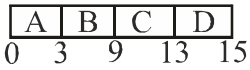
For the next packet, except transmission of first link, every others time will be overlapped as A transmists packets after every 500 μsec.

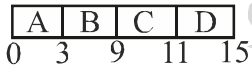
∴ Required time = 1075 + 500 = 1575 μsec

1575 is the answer.

47.

Process	A.T	P.T.	FCFS	SJF	SRTF	R.R
A	0	3	3 – 0 = 3	3 – 0 = 3	3 – 0 = 3	5 – 0 = 5
B	1	6	9 – 1 = 8	9 – 1 = 8	15 – 1 = 14	15 – 1 = 14
C	4	4	13 – 4 = 9	15 – 4 = 11	8 – 4 = 4	13 – 4 = 9
D	6	2	15 – 6 = 9	11 – 6 = 5	10 – 6 = 4	11 – 6 = 5
Average TAT			7.25	6.75	6.25	8.25

FCFS 

SJF 

SRTF 

Ready Queue : A B A C B D C B

∴ SRTF gives minimum Turn around time

TAT = completion time – Arrival time

(C) is the answer

48.

Sol : Cyclomatic complexity is given as

C = E – V + 2P

E – edges in a graph

V – Vertices/nodes in a graph

P – number of connected components

For Y,

E = 10, V = 8, and P = 1

∴ C = E – V + 2P

∴ C = 10 – 8 + 2

∴ $\boxed{C = 4}$

For X, the control flow diagram will be

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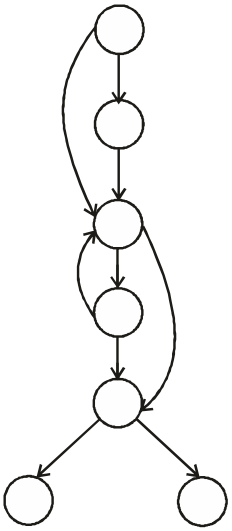


$\therefore$ E = 9

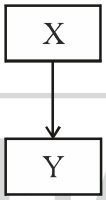
V = 7

P = 1

$\therefore$ C = E – V + 2P

= 9 – 7 + 2

$\therefore$ $\boxed{C = 4}$



Now, for

E = 9 + 10 + 1 (from X to Y)

$\therefore$ E = 20

V = Vx + Vy = 8 + 7 = 15

and P = 1

$\therefore$ C = E – V + 2P

= 20 – 15 + 2(1)

$\therefore$ $\boxed{C = 7}$

$\therefore$ (A) is the answer.

49. $(43)_x = (y3)_8$

$4 \times x^1 + 3 \times x^0 = y + 8^1 + 3 \times 8^0$

$4x + 3 = 8y + 3$

$\therefore$ $4x = 8y$

$\therefore$ $\boxed{x = 2y}$ ——— (1)

Also $x > 4$ and $y < 8$ ——— (2)

$\therefore$ $x >= 5$ and $0 \leq y \leq 7$

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x	y	
0	0	
2	1	
4	2	
6	3	Satisfy the given constraints
8	4	
10	5	
12	6	
14	7	

$\therefore$ No. of solutions = 5

50. $((p, q), (r, s)) \in R$ iff $p - s = q - r$

Let $((p, q), (p, q) \in R$

$\therefore$ $p - q \neq q - p$

$\therefore$ Not reflexive

Let $((p, q), (q, p)) \in R$

$\therefore$ $p - p = q - q = 0$

$\therefore$ symmetric

(C) is correct

51. Xi = for i = 1, 2, 3 are independent and identically distributed random variables

$p(Xi = 0) = P(Xi = 1) = 1/2$

$\therefore$ Xi can take value 0 or 1 independently

X_1	X_2	X_3	$Y = X_1 X_2 \oplus X_3$
0	0	(0)	[0]
0	0	1	1
0	1	(0)	[0]
0	1	1	1
1	0	(0)	[0]
1	0	1	1
1	1	(0)	1
1	1	1	[0]

$$\therefore P(Y = 0 \mid X_3 = 0) = \frac{P(Y = 0 \cap X_3 = 0)}{P(X_3 = 0)}$$

$$= \frac{3/8}{4/8}$$

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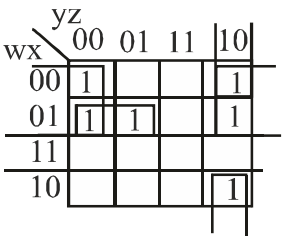
$= \frac{3}{4}$

$= 0.75$

$\therefore$ 0.75 is the answer

52. $f(w, x, y, z) = \Sigma (0, 2, 4, 5, 6, 10)$



$\therefore$ 1 quad + 2 pairs

$\therefore$ $f = \bar{w}\bar{z} + \bar{w}x\bar{y} + \bar{x}y\bar{z}$

$\therefore$ 3 prime implicants

$\therefore$ 3 is the answer

53. K = 4, c = < 1, 0, 1, 1 >

a = 2 n = 8

DoSomething (c, a, n)

$z \leftarrow 1$

for (i = 0 to k – 1) i.e. i = 0 to 3

i = 0

$z \leftarrow z^2 \% n = 1 \% 8 = 1$

c [1] = 1 True

$\therefore z \leftarrow (z \times a) \% n$

$\therefore z \leftarrow 2\% 8 = 2$

$\therefore \boxed{z \leftarrow 2}$

i = 1

$z \neg z2 \% n = 4 \% 8 = 4$

c [1] = 1 false

$\therefore \boxed{z \leftarrow 4}$

i = 2

$z \leftarrow z^2 \% n = 16\% 8 = 0 \quad \therefore \boxed{z \leftarrow 0}$

c[2] = 1 true

$\therefore z \leftarrow (z \times a) \% n = 0 \qquad (\because z = 0)$

i = 3

$z \leftarrow z^2 \% n = 0$

c[3] = 1 True

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$\therefore$ $z \leftarrow (z \times a)\ \%\ n$

$\therefore$ $z \leftarrow 0\ \%\ 8 = 0$

$\therefore$ $\boxed{z \leftarrow 0}$

$\therefore$ Output is $z = 0$

0 is the answer

54. $f(n) = n$

$g(n) = n^{(1 + \sin n)}$

Range of values of $1 + \sin n$

$1 + (-1)$ to $1 + 1$

$\therefore$ 0 to 2

i.e. $1 + \sin n$ is an oscillating function

$\therefore$ $n^{(1 + \sin n)} = n^{(1 - 1)} = n^0 = 1$

or $n^{(1 + \sin n)} = n^{1 + 1} = n^2$

$\therefore$ $f(n) < c.\ g(n)$ —— cannot be always true for every $n \geq n_0$

$\therefore$ (I) is false

Similarly (II) is also false

(D) is the correct answer

55. $S \rightarrow F/H$

$F \rightarrow p/c$

$H \rightarrow d/c$

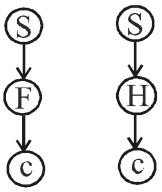
First (F) = {p, c}

First (H) = {d, c}

First (f) $\cap$ first (H) = c $\neq \phi$

$\therefore$ Grammar is not LL(1)

Also the grammer is ambiguous because w = c has 2 parse trees



$\therefore$ Grammar cannot be either of LL(1) or LR (1)

$\therefore$ (D) is the correct option

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GENRAL APTITUDE SECTION

1. (B)

2. Children's doctor is known as pediatrician and doctor of females is known as gynaecologist
   ∴ (B) is correct

3. Here we are referring to a unique movie and hence, the John Abraham-starrer
   ∴ (C) is correct

4. R O A D ∴ S W A N
   +3 +3 +3 +3 +3 +3 +3 +3
   U R D G V Z D Q
   (B) is correct

5. Let f(x) = ax + b
   f (–2) = 29
   ∴ –2a + b = 29 _____ (1)
   f(3) = 39
   ∴ 3a + b = 39 _____ (2)
   (1) – (2),
   –2a + b = 29
   –3a + b = –39
   –5a = –10
   ∴ $\boxed{a = 2}$
   ∴ 3a + b = 39
   6 + b = 39
   b = 33
   ∴ f(x) = 2x + 33
   ∴ f(5) = 2(5) + 33
   ∴ f(5) = 2(5) + 33 = 43
   (C) is correct

6.Conquering Persia turned Alexander's attention towards India.
   ∴ (A) is correct.

7. (i) is not valid
   (ii) and (iii) are valid
   (iv) is invalid
   ∴ (B) is correct

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8.

Year	Imports	Exports	Total
2000	40	50	90
2001	50	60	110
2002	60	70	130
2003	70	60	130
2004	80	70	150
2005	90	70	160
2006	120	100	220
2007	120	110	230

Increase in 2007 = $\frac{10}{220} \times 100 = 4.54\%$

Increase in 2006 = $\frac{220-160}{220} \times 100 = 37.5\%$

Increase in 2005 = $\frac{10}{150} \times 100 = 6.67\%$

Clearly, in rest of the years, increase cannot be greater than that in 2006.

$\therefore$ 2006 is the answer

9. For x = 2, y = 1,

Only (B) satisfies the above values

x = –(y – |y|)

2 = –(– 1 – |–1|)

= – (–2)

= 2

$\therefore$ (B) is correct

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10.

P	Q	R	S	T	U
	If S gets Power/telecom, then she must get other one	Home/Finance		If p gets one, T gets one	No portfolio if s gets 1 of 5

Only (B) satisfies the above condition

(A) and (D) are eliminated because of R

(C) is eliminated because of U and S constraints.