GATEFORUM Engineering Success |CS|Test ID: 2217 **TarGATE'14** *www.gateforum.com*

Answer Keys

1	0.07	2	C	3	C	4	3	5	D	6	C	7	D
8	D	9	C	10	C	11	A	12	A	13	D	14	C
15	C	16	C	17	C	18	B	19	D	20	C	21	B
22	D	23	C	24	C	25	B	26	**C**	27	C	28	2.5
29	B	30	C	31	2	32	255	33	C	34	B	35	D
36	D	37	A	38	A	39	C	40	B	41	15	42	A
43	B	44	B	45	C	46	A	47	D	48	B	49	C
50	D	51	D	52	D	53	B	54	C	55	A	56	D
57	D	58	A	59	A	60	B	61	B	62	D	63	B
64	B	65	B										

Explanations:-

1. $P(x+y=2) = P(x=0, y=2) + P(x=1, y=1) + P(x=2, y=0) [\because x \text{ and } y \text{ are independent}]$

    $= {}^4C_0\left(\frac{1}{2}\right)^4 \cdot {}^5C_2\left(\frac{1}{2}\right)^5 + {}^4C_1\left(\frac{1}{2}\right)^4 \cdot {}^5C_1\left(\frac{1}{2}\right)^5 + {}^4C_2\left(\frac{1}{2}\right)^4 \cdot {}^5C_0\left(\frac{1}{2}\right)^5 = 0.07$

2. Given : $f(x) = \log_7 x$; let $\log_7 x = y \Rightarrow x = 7^y$; $\therefore f^{-1}(x) = 7^x$
    Also we know that $fof^{-1}(x) = f^{-1}of(x) = I(x) = x$

3. (c) is false because if all *x*'s are related to some *y*, it does not necessarily mean it's always the same *y*.

4. Field in header gives number of chars in frame.

5 4 3 2 5
Frame 1

6 7 8 9 3 2
Frame 2

4 1 2 3
Frame 3

6. No rows are selected by outer query because inner query returns empty relation due to false where condition, as 'any' returns false on empty relation for all the rows.

7. The given Schedule is Not Serializable, since it is NOT Conflict Serializable, NOT View Serializable

8. Because "T2" read the modified data of "T1" and committed without waiting for "T1" to commit.

9. Contention period is time period in which we deal with collision i.e. equivalent to round trip time.
    RTT= 2* end to end propagation delay=2* 125μ sec = 250μ sec

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11.   1st printf will increment A [0] and print 68.
      2nd printf will increment pointer to point to A[1] and print 43.
      3rd printf will print 43 and then pointer will be incremented

12.   Static variable is initialized only once and it will retain the value in between the
      function calls. On the last iteration n & i will become 340 and 550 respectively
      and so it will return 340+550 = 890.

13.   By using circular doubly linked list, last element of string can be accessed in
      constant $(\theta(1))$ time.

14.   According to Watson-Felix model of cost estimation
      Effort = 5.2*(KLOC)$^{0.91}$ person-months.
              =5.2*(1000)$^{0.91}$ = 2792 person months

16.   (A) & (B) are not context free languages.
      (C) In L_1 number of b's = number of c's, in L_2 number of a's = number of b's
       Hence in $L_1 \cap L_2$, number of a's =number of b's = number of c's , which is not
      context free.

17.   (A) When b ends in string, one a should always come because of production
          $S \rightarrow bS / aA$ But it is not present in the given string
      (B) d never comes after b immediately
      (D) 'baba' can never be a substring
      (C) $S \rightarrow bS$

              $S \rightarrow bbS$ $S \rightarrow bS$
                 $\rightarrow bbbS$ $S \rightarrow bS$
                 $\rightarrow bbbbS$ $S \rightarrow bS$
                 $\rightarrow bbbbaA$ $S \rightarrow aA$
                 $\rightarrow bbbbacccA$ $A \rightarrow cccA$
                 $\rightarrow bbbbaccccA$ $A \rightarrow ccA$
                 $\rightarrow bbbbaccccd$ $A \rightarrow d$

18.   prefix expression is $+ - + a\underline{b * c}\ de$

19.   With $f_2 = \Sigma(6,7,2)$, f will become $\Sigma(6,7,2)$ which is contradiction to the data given
      in question.

20. $T_{PDFF} \leq T_{CLK}$
      $\therefore \frac{1}{40n\sec} \leq T_{CLK}$
      $\therefore \frac{1}{40n\sec} \geq F_{CLK}$
      $\therefore F_{CLK} \leq 25MHz$
      So 25MHz is the maximum usable frequency.

21.   It causes infinite recursion, so stack overflows.

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23.   An inherited attribute is one whose value at a node is defined in terms of attributes of the parent and/or sibling of that node.

25. $f'(x) = 2.\dfrac{2}{3}(x-1)^{-\frac{1}{3}}$

$f'(1) = \infty \Rightarrow f(x)$ is not differentiable in $(0, 2)$

$f(x)$ is continuous $\forall \; x \in [0, 2]$ and $f(0) = f(2)$

26.   As i is declared as static, by default it will be initialized to 0 and ++**q will print 1.

27.
$\left.\begin{array}{lll} 00000000 & \text{xxxxxxxxxxxx} & \text{xxxxxxxxxxxx} \\ 11101111 & \text{xxxxxxxxxxxx} & \text{xxxxxxxxxxxx} \end{array}\right\}$ 240, 2 – address instructions

$\left.\begin{array}{lll} \left.\begin{array}{lll} 11110000 & 000000000000 & \text{xxxxxxxxxxxx} \\ 11110000 & 111111111111 & \text{xxxxxxxxxxxx} \end{array}\right\}2^{12} \\ \left.\begin{array}{lll} 11110001 & 000000000000 & \text{xxxxxxxxxxxx} \\ 11110001 & 111111111111 & \text{xxxxxxxxxxxx} \end{array}\right\}2^{12} \\ \vdots \\ \left.\begin{array}{lll} 11111111 & 000000000000 & \text{xxxxxxxxxxxx} \\ 11111111 & 111111111111 & \text{xxxxxxxxxxxx} \end{array}\right\}2^{12} \end{array}\right\}16 * 2^{12}, \; 1 – \text{address instructions}$

28.

A	D	C	B

0   4   5   7   10

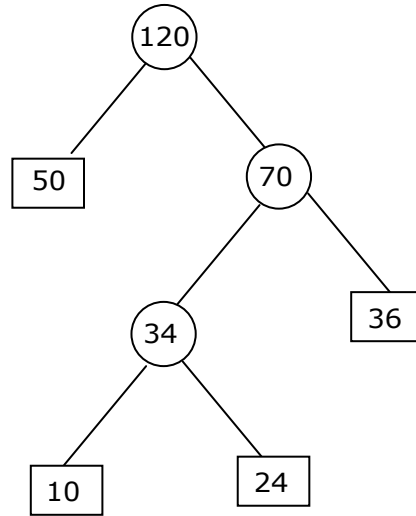$\dfrac{0+6+3+1}{4} = \dfrac{10}{4} = 2.5$ ms.

30.   AC will be the only candidate key. So $A \rightarrow BD, C \rightarrow E$ are partial dependencies and will violate 2NF property. Hence those should be taken as separate relations. Hence the 2NF decomposition will be $R_1(A,B,D)$ $R_2(C,E)$ $R_3(A,C)$.

31.
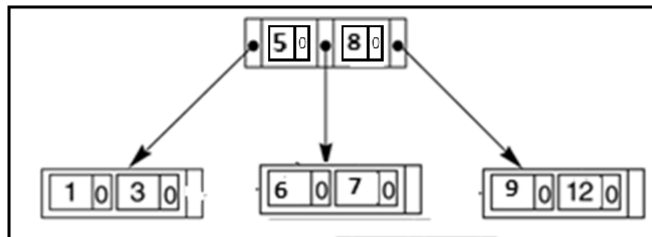
32. $\text{loc}\big(A[7][15]\big) = 100 + [7*20+15]*1 = 255$

33. Total size = 120×2=240 million bits

Using Huffman total size = 50(1) + 36(2) + 10(3) +24 (3)

=224 million bits

So it is 6.66% improvement

34.
for $(i = 1; \ i <= n; \ i++)$ runs $(n+1)$ times

    for $(j = i; \ j < i^2; \ j++)$ runs $n \times n^2$ times

        do − something();   runs $n \times n^2$ times

total time taken is $(n+1) + (n \times n^2) + (n \times n^2) = \Theta(n^3)$

35. 2 4 1 5 3 is wrong because after popping 4, 1 can't be popped as top of stack is pointing to 3.

36. $\dfrac{8 \times 2^{30}}{8}$ byte is transmitted in $1 \sec$

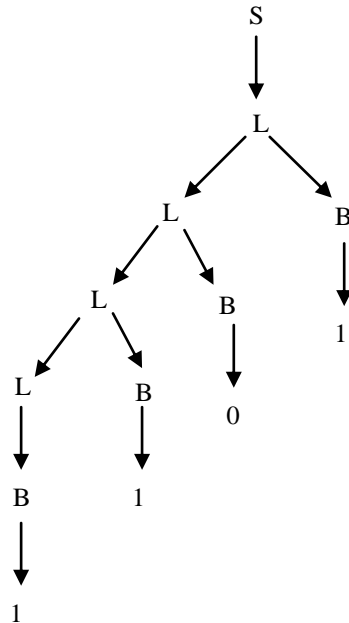∴ In 4 sec onds, $2^{30} \times 4 = 2^{32}$ bytes will be transmitted

So, sequence number requires 32 bits.

37. Between B and C, S is half close and at the label D, X=4001, Y=9501.

38. Here we have 3 minimal elements 2, 3 and 5 for any two of which, greater lower bound does not exist; hence the given poset is not a meet semi lattice.

However for every pair of elements in the poset least upper bound exists, hence the given poset is join semi lattice.

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39. The parse tree for the input string 1101 is as follows

40. Strings of length 3   001
Strings of length 4   0011, 1101
Strings of length 5   00011

41. Gantt Chart

P_1	P_4	P_6	P_3	P_2	P_5

0   4   10   15   23   28   31
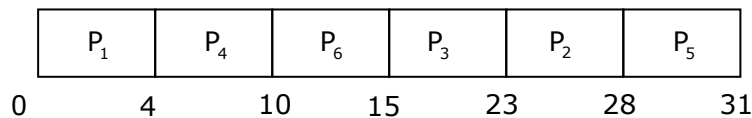
$\therefore$ Completion Time of $P_6 = 15$.

42. The sum of the degrees of the regions is equal to twice the number of edges. But each region must have degree ≥ 4 because all cycles have length ≥ 4. So we have $2e \geq 4r$.

By Euler's formula: $v - e + r = 2$, so combining these

$e - v + 2 \leq \dfrac{1}{2}e \Rightarrow \boxed{e \leq 2v - 4}$

43. $F = A\,\overline{B}\,\overline{C} + A\,B\,\overline{C} + \overline{A}\,B\,\overline{C} + \overline{A}\,B\,C$
      100   110   010   011
$F = \sum m(4, 6, 2, 3) = \sum m(2, 3, 4, 6)$

44. 1 and 3 are isomorphic.

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45. We have AP = PD where P is modal matrix and D is spectral matrix

$\Rightarrow D = P^{-1}AP \Rightarrow D^n = P^{-1}A^nP$

$\therefore P^{-1}A^2P = D^2$

Here $D = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ $(\because 1, 2, 3 \text{ are eigen values of } A)$

$\Rightarrow D^2 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 9 \end{bmatrix}$

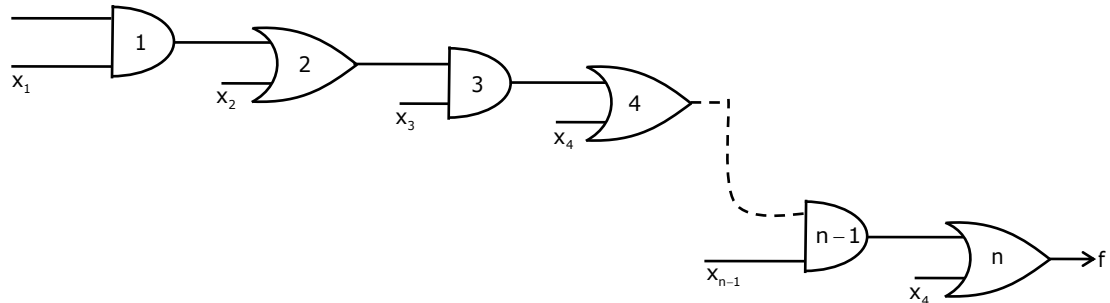46. f(x)=x+sinx

f'(x)=1+cosx

Formula in $x_{n+1} = x_n - \dfrac{f(x_n)}{f'(x_n)}$

$x_{n+1} = x_n - \dfrac{x_n + \sin x_n}{1 + \cos x_n} = \dfrac{x_n + x_n \cos x_n - x_n - \sin x_n}{1 + \cos x_n} = x_n \cos x_n - \sin x_n$

$\boxed{x_{n+1} = \dfrac{x_n \cos x_n - \sin x_n}{1 + \cos x_n}}$

47. In terms of Boolean expressions,

$\%_p$ of 1 is $x_0 x_1 \Rightarrow \%_p$ of 2 is $(x_0 x_1 + x_2) \Rightarrow \%_p$ of 3 is $(x_0 x_1 + x_2) x_3 = x_0 x_1 x_3 + x_2 x_3$

$\%_p$ of 4 is $x_0 x_1 x_3 + x_2 x_3 + x_4 \Rightarrow \%_p$ of 5 is $x_0 x_1 x_3 x_5 = x_2 x_3 x_5 + x_4 x_5$

$\%_p$ of 6 is $x_0 x_1 x_3 x_5 + x_2 x_3 x_5 + x_4 x_5 x_6 \Rightarrow$ for n gates connected as shown, $\%_p$ is

$x_0 x_1 x_3 \ldots x_{n-1} + x_2 x_3 x_5 \ldots x_{n-1} + x_4 x_5 x_7 \ldots x_{n-1} \ldots + x_{n-2} x_{n-1} + x_n$

48. 1st at 60-> 55->42->15->11->5->4->73->90

5+13+27+4+6+1+69+17=142

6

49. If the head is moving towards 0,

60->55->42->15->11->5->4->0->73->90

So total head movements=5+13+27+4+6+1+4+73+17=150

If the head is moving towards 99,

60->73->90->99->55->42->15->11->5->4

So total head movements=13+17+9+44+13+27+4+6+1=134

So the diff is 150-134=16

50 & 51. K-map will be

wx\yz	00	01	11	10
00	0	0	0	1
01	d	0	d	d
11	1	0	d	1
10	1	1	d	d

One of the solutions is

wx\yz	00	01	11	10
00	0	0	0	1
01	d	0	d	d
11	1	0	d	1
10	1	1	d	d

$$F(w,x,y,z) = wz' + wx' + yz'$$

wx\yz	00	01	11	10
00	0	0	0	1
01	d	0	d	d
11	1	0	d	1
10	1	1	d	d

$$F(w,x,y,z) = XZ' + YZ' + WX'$$

These are two possible minimized solutions, where prime implicants are wz', wx', yz', xz' and essential prime implicants are wx', yz'.

52.   Recording area= outer area- inner area

$$= \pi\left(\frac{7}{2}\right)^2 - \pi\left(\frac{4}{2}\right)^2 = 25.905 \text{ square inch}$$

Given density is 40×10^6 bits/square inch,
So, disk capacity $=25.905\times40\times10^6=1036.2\times10^6$ bits
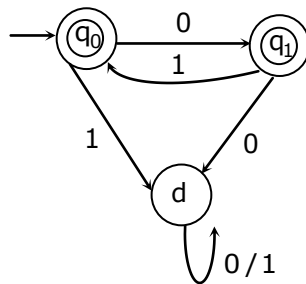Total radial spacing =outer diameter – inner diameter=7-4=3 inch
Number of tracks $=3\times2000=6000$ tracks

$$\text{Average density/track} = \frac{1036.2\times10^6}{6000} = 172.7 \text{ kb / track}$$

53. $$\text{Data transfer rate} = \frac{172.7}{8} \times \frac{3600}{60} = 1.29\,\text{MBps}$$

54.   010101---------; prefixes: $\in/0/01/010/0101\ldots\ldots$; Regular expression: $0(10)^* + (01)^*$

55.   DFA is

57.   A, B, C are outdoor games
       D is Indoor game

59.   Integration is a part of Mathematics
       Zoology is a part of Biology

60. $(1+2+3+\ldots\ldots+71+72+73+\ldots\ldots100) - (1+2+3+\ldots.70)$

$$= \frac{100}{2}\times(1+100) - \frac{70}{2}\times(1+70)$$

$$= (50\times101) - (35\times71) \Rightarrow (5050-2485) = 2565$$

61. (A) Universal

(B) Specified

(C) Universal

(D) Universal

62. Ratio of days taken by A and B = 1:3
Time difference = 3-1 = 2 days
While B takes 3 days & A takes 1 day.
If difference of time is 2 days, B takes 3 days
If difference of time is 60 days $\frac{3}{2} \times 60 = 90$ days

$(A + B)$'s one day's work $= \frac{1}{30} + \frac{2}{90} = \frac{2}{45}$

$A + B$ together do work in $\frac{45}{2} = 22.5$ days

63. Percentage of money spent on Tennis =
$\left(\frac{45}{360} \times 100\right) \% = 12\frac{1}{2}\%$

64. Required numbers are 16, 24, 32, 40 ,………., 96
$a = 16, d = 8 \ \& \ \ell = 96$

Then $t_n = 96$

$\Rightarrow a + (n-1)d = 96$

$16 + (n-1)8 = 96 \Rightarrow (n-1)8 = 80$

$n - 1 = 10 \ \therefore \ n = 11$

65. When Vowels EAI are always together, they are supposed to be one Letter. Now
we have to arrange LNDG (EAI)
Now 5 Letters can be arranged in 5! = 120 ways
(EAI) 3 Letters can be arranged in 3! = 6 ways
Total ways = 120 x 6 = 720 ways

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