Answer Keys

1	D	**2**	D	**3**	A	**4**	A	**5**	B	**6**	5	**7**	D
8	D	**9**	D	**10**	6.5	**11**	D	**12**	D	**13**	7	**14**	A
15	B	**16**	D	**17**	C	**18**	1	**19**	B	**20**	C	**21**	C
22	D	**23**	B	**24**	D	**25**	A	**26**	C	**27**	D	**28**	A
29	D	**30**	D	**31**	C	**32**	B	**33**	B	**34**	12	**35**	B
36	296.2	**37**	98	**38**	B	**39**	C	**40**	D	**41**	B	**42**	8
43	D	**44**	D	**45**	3	**46**	230	**47**	A	**48**	B	**49**	C
50	B	**51**	A	**52**	B	**53**	B	**54**	A	**55**	D	**56**	B
57	D	**58**	A	**59**	C	**60**	A	**61**	B	**62**	B	**63**	D
64	A	**65**	D										

Explanations:-

2. If the limit, $\underset{x\to\alpha}{lt}\left[f_1\ x\ \ f_2\ x\right]$ exists, then $\underset{x\to\alpha}{lt}\ f_1\ x$ and $\underset{x\to\alpha}{lt}\ f_2\ x$ may or may not exist.

3. $CX\ \ A^C \cup B^C\ ^C = CX\ \ A\cap B \quad \left[\because\ A^C \cup B^C\ ^C =\ A\cap B\right]$

$CXA\ \cap\ CXB$

4. Given that mean $=4 \Rightarrow \dfrac{a+b}{2}=4$

$\Rightarrow a+b=8 \qquad ......(1)$

$\text{var iance} = 12 \Rightarrow \dfrac{(b-a)^2}{12} = 12$

$\Rightarrow (b-a)^2 = 144$

$\Rightarrow b-a = \pm 12 \qquad ......(2)$

$a+b=8$	$a+b=8$
$b-a=12$	$b-a=-12$
$2b=20$	$2b=-4$
$b=10$	$b=-2$
$a=-2$	$a=10$

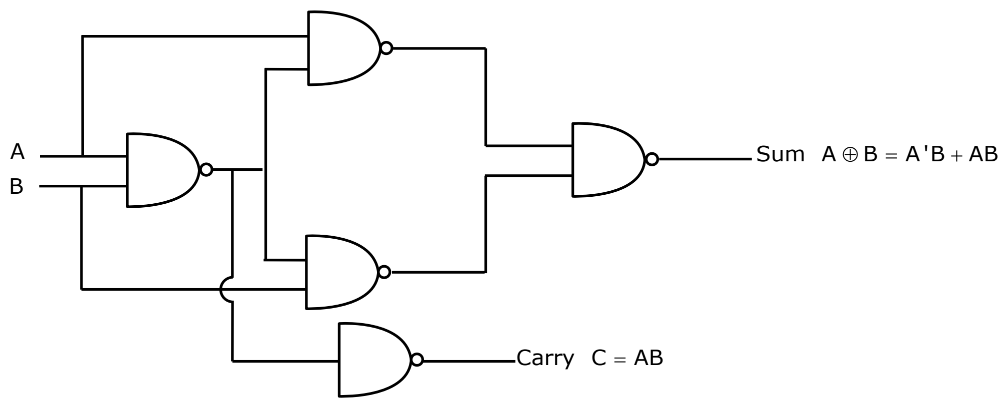
$\therefore a=-2$ and $b=10\ (\because a<b)$

5. Number of levels $= \log_2 2^n = n$

Number of multiplexers at i^{th} level $= 2^n/2^i = 2^{n-1} + 2^{n-2} + - - - - + 1$

$= 2^n - 1$

6.



8. Let assume n = 8
The range is -128 to 127

9. Gantt Chart for order 1 is:

P_1	P_2	P_3	P_4

0 10 13 21 26

Avg waiting time=(0+10+13+21)/4=11

Gantt Chart for order 2 is:

P_2	P_3	P_4	P_1

0 3 11 16 26

Avg waiting time=(0+3+11+16)/4=7.5

Gantt Chart for order 3 is:

P_4	P_3	P_2	P_1

0 5 13 16 26

Avg waiting time=(0+5+13+16)/4=8.5

Gantt Chart for order 4 is:

P_4	P_2	P_3	P_1

0 5 8 16 26

Avg waiting time=(0+5+8+16)/4=7.25

10. If τ_{n+1} is the expected time for (n+1)th CPU Burst and t_n is the length of nth CPU burst, then

$\tau_{n+1} = \alpha * t_n + (1-\alpha) * \tau_n$

$\tau_1=4$, $t_1=4$, $t_2=12$, $t_3=8$

So using exponential average algorithm

$\tau_2 = 0.25 * 4 + 0.75 * 4 = 4$

$\tau_3 = 0.25 * 12 + 0.75 * 4 = 6$

$\tau_4 = 0.25 * 8 + 0.75 * 6 = 6.5$

11. The system is deadlock free. The order of safe state is <P3, P2, P1> or <P3, P1, P2>

12. Explanation:
   - (i) As we cannot identify a workstation by knowing the physical address even though it is connected to internet, physical address does not have topological significance.
   - (ii) ARP request is used to find the MAC address of the host given its IP address. Whereas RARP request is used to find IP address of a host if given its MAC address.
   - (iii) RARP request is broadcasted to data link layer. So the request cannot cross the network boundaries. So, each network should have one RARP server.
   - (iv) In DHCP, mapping IP addresses is both static and dynamic. This is the difference between DHCP and BOOTP. In BOOTP, mapping is static.

13. $V\ G = E - N + 2$

$= 15 - 10 + 2 = 7$

15. Given expression

$a + b \times\ a + b\ + c + d$

$t_1 = a + b$

$t_2 = b \times t_1$

$t_3 = a + t_2$

$t_4 = t_3 + c$

$t_5 = t_4 + d$

16. Number of three hostels $= N \times \frac{30}{100} \times 3 = \frac{9N}{10}$

Number of two hostels $= N \times \frac{50}{100} \times 2 = \frac{10N}{10}$

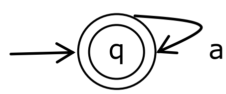
Number of one hostels $= N \times \frac{20}{100} \times 1 = \frac{2N}{10}$

Required probability $= \dfrac{\frac{9N}{10}}{\frac{9N}{10} + \frac{10N}{10} + \frac{2N}{10}} = \frac{9N}{10} \times \frac{10}{21N} = \frac{9}{21}$

17. Taking $= 4 \Rightarrow h = \frac{b-a}{4}$ and using simpon's $\frac{1}{3}$rd rule, we get

$$\int_a^b f(x)dx = \frac{b-a}{4}\left[\frac{f(a)+f(b)}{3} + \frac{4}{3}\left\{f\left(\frac{3a+b}{4}\right) + f\left(\frac{a+3b}{4}\right) + \frac{2}{3}f\left(\frac{a+b}{2}\right)\right\}\right]$$

18. $a + aaa^* = a^*$



This is simply because, all the patterns $\in, a, aa, aaa......$ can be generated by $a + aaa^*$

19. As $1 \le n \le 1000$, length of L is always finite, hence it is regular.

20. (i) Local optimization (function preserving transformation) are commonly
   a. Common sub expression elimination
   b. copy propogation
   c. Dead-code eliminiation
   d. constant folding

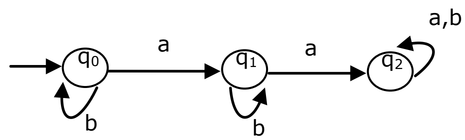
   (ii) The running time of a program may be improved if we decrease the number of instructions in an inner loop, even if we increase the amount of code outside that loop. This process contains following mechanisms.
   a. code motion
   b. induction variable elimination
   c. Reduction in strength

   (iii) Constant folding is the replacement of expression that can be evaluated at compile time by their computed values, i.e., if the values of all the operands of an expression are known to the computer at compile time, the expression can be replaced by its computed value.

21. X-> Y, if each X value is associated with precisely one Y value.

22. Because conservative 2PL won't allow the transactions to wait for new locks by holding existing locks. The transaction will be started only if all the locks required for the transaction is available

23. Example: Number of a's at least '2' contains 3 states



Number of a's at least 'n' contain (n+1) states

24. Can't change it by ++ operator as it is a pre processor value

25. 10<20<5<1

$\rightarrow 1 < 5 < 1$

$1 < 1$

$\boxed{0}$

26. $\text{Irreflexive} = 2^{N^2-N}$ | $\text{Asymmetric} - 3^{\frac{N^2-N}{2}}$

$\text{Not Reflexive} = 2^{N^2} - 2^{N^2-N}$ | $\text{Antisymmetric} - 2^N \times 3^{\frac{N^2-N}{2}}$

27. The given statement is: For every person x and every person y, if x and y are neighbours, then either x should help y or y will not help x.

$$\forall x \; \forall y \; N\ x,y \rightarrow H\ x,y \vee \neg P\ y,x$$

Its negation is

$$\neg \; \forall x \; \forall y \; N\ x,y \rightarrow H\ x,y \vee \neg P\ y,x$$

$$\text{i.e } \exists x \; \neg \; \forall y \; \neg N\ x,y \vee H\ x,y \vee \neg P\ y,x$$

$$\text{i.e } \exists x \; \exists y \; \neg \; \neg \; N\ x,y \vee H\ x,y \vee \neg P\ y,x$$

$$\text{i.e } \exists x \; \exists y \; N\ x,y \wedge \neg H\ x,y \wedge P\ y,x$$

28. $\left|A^{501} - A^{500}\right| = \left|A^{500}(A-I)\right| = \left|A^{500}\right|\left|A-I\right| \qquad \because |AB| = |A||B|$

$$\Rightarrow \left|A^{500}\right| \begin{vmatrix} 0 & 2 & 3 \\ 1 & 1 & 4 \\ 1 & 1 & 4 \end{vmatrix} = \left|A^{500}\right|.0 = 0$$

29. Whenever fork is called, a new process is created and statements after fork will be executed in all the processes which are available at that time. So after 1st fork 2 processes will be there with i=2(parent and child), then 4 processes with i=3 after 2nd fork. And finally after 3rd fork 8 processes will be there with i=4. But order can be different based on whether parent process or child process executes first. So we can get any of first 3 options as output.

30. Always R will be executed 1st as s2=1. Then after that, 2 will be printed and s0 will become 1 by executing V(s0).
Then P will be executed. 0 is printed. s0=0, s1=1, s2=0.
Then Q will be executed. 1 is printed. s0=0, s1=1, s2=0.
So after this only Q can be executed, resulting the pattern 201^+

31. We still need 12 bits for offset. Since we have 4 bytes per page table entry, one page frame can fit 4 KB/4 B= 1024 page entries. We need 10 bits to index into a page of the page table. Then we have 44 - 12 -10= 12 bits left for the page number.
So outer index, inner index and offset will have 10, 10 and 12 bits respectively.

32. subnet mask 255.255.11100000.0
first subnetwork Address is 132.55.0.0
first host in first subnetwork is 132.55.0.1
second subnetwork address is 132.55.32.0
second subnet and second host is 132.55.32.2

33. $d_{min} = 5$
Let, t be the number of bit errors that can be corrected
$d_{min} = 2t + 1$
$\therefore\ t = \frac{d_{min} - 1}{2} = \frac{5 - 1}{2} = 2$

34. After every 2 consecutive 1's a 0 is stuffed.
Data will be sent as "0110110010011011011001101 0"
So, total number of zeros in the resultant bit stream is 12.

35.

Clock Cycles	Q_A	Q_B	Q_C	Q_D
	0	0	0	0
1	1	0	0	0
2	1	1	0	0
3	0	1	1	0
4	0	0	1	1
5	0	0	0	1
6	0	0	0	0

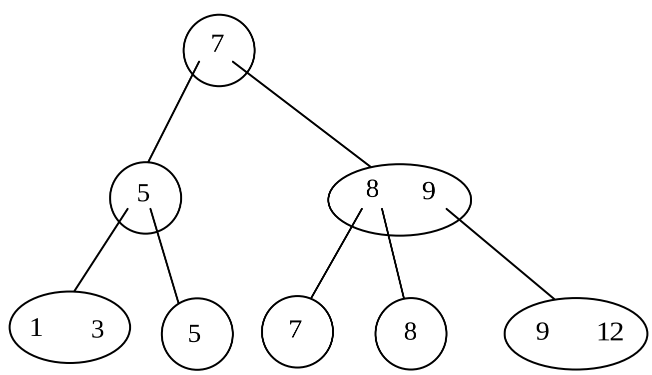
36. $T_{ave}=0.85(0.92\times100+0.08\times1000)+0.15(1000)$
$T_{ave}= 296.2$ ns

37. $K_A=8[2ns]$
$K_B=5[3ns, 2ns, 1ns, 3ns, 2ns]$
$T_n = (K + (N - 1)) * T_{CP}$
Given is $N = 100, T_{CP-A} = 2ns, T_{CP-B} = Max(S_i) = 3ns$
So $T_A = (8 + 99) * 2ns = 214\ ns$
$T_B = (5 + 99) * 3ns = 312 ns$
Time saved is $= 312 - 214 = 98ns$

39. (i) Every finite subset of either regular or non-regular set is always regular.
(ii) Every subset of a regular set need not be regular as subset may be infinite
For example $a^n b^n \subset (a + b)*$, but not regular.
(iii) $L1=a*b*$ $L2=\{b^n a^n ;n>1\}$, L1 is regular and L2 is non-regular
and $L1 \cap L2 = \phi =$ Regular language

40. Regular expression for the given grammar is (a+b)*aa(a+b)*, which says atleast two consecutive a's are there in every string of the language generated by given grammar.

42. B^+ tree for the given keys is as follows:

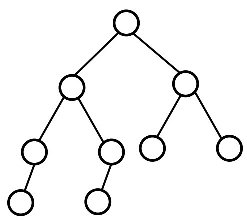


Total 8 nodes.

43. In call by value, function foo() operate on copy of x, hence value of x remains unchanged. In call by reference, first value of x changes to 4+4, then it changes to 8+8, hence 16.

44. When we evaluate post-fix expression the stack contents will be:
8
8, 6
8, 6, 3
8, 2
10
10, 3
10, 3, 2
10, 6

45.



46.

J_3	J_7	J_5	J_6

0 1 2 3 4

Total profit = 60 + 70 +90 +10
=230

47. The fractions f_i of weights of items to be chosen is $f_1, f_2, f_3, f_4, f_5 = (1, 1, 2/15, 1, 1)$

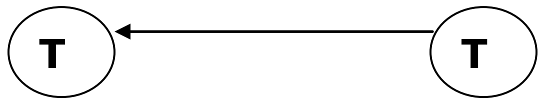
48. Removal of edges given in options (C) and (D) also disconnects the graph in option (C) e_6 cutting is not required and in option (d) e_9 is not required. Hence they are not cutsets.

49. Removal of vertex v_4 disconnects the graph into the parts.

50. Offset = 80
So first Byte id is 80 × 8 = 640
Header length is 10 × 4 = 40 Bytes
Data sale = 200 – 400 = 160 Bytes
So the first Byte is 640 and the last Byte is 799.

51. IPV4 Header compulsory field is 20 Bytes.
So option field = 40 – 20 = 20 Bytes.

52. The precedence graph of only "S2" has no cycle



53. The serial order is T2 then T1

54 &55

Q_2	Q_1	Q_o
1	1	1
1	1	0
1	0	1
1	0	0
0	1	1
1	1	1

56. "The" should be used before "Dog" because a singular noun is meant to represent a whole category.

57. Governor is the head of state
Speaker is the head of Loksabha

59. A, B, D have repetition of two literals
C have repetition of three literals

60. $A : B = \left[4x \times 3 + \left(4x - \frac{1}{4} \times 4x\right) \times 7\right]$

$= \left[5x \times 3 + \left(5x - \frac{1}{5} \times 5x\right) \times 7\right]$

$= 12x + 21x \; : \; 15x + 28x = 33x : 43x$

A's share = $760 \times \frac{33}{76} = \text{Rs.}330$

62. Let cost price of each article be Rs.1
Cost price of x articles = Rs. x
Selling price of x articles = Rs.130

$\text{Profit} = \text{Rs. } 130 - x \quad \therefore \frac{130 - x}{x} \times 100 = 30$

$13000 - 100x = 30x$

$x = \frac{13000}{130} = 100$

63. Let the ages of children is $x,\ x+3\ ,\ x+6\ ,\ x+9\ \&\ x+12$ yrs.

Then $x + x+3 + x+6 + x+9 + x+12 = 50$

$5x + 30 = 50 \Rightarrow x = 4$

64. The numbers are $23 \times 13\ \&\ 23 \times 14$

So, $\text{Larger number} = 23 \times 14 = 322$

65. $\therefore \text{Required Percentage} = \frac{50-25}{25} \times 100\ \% = 100\%$