Answer Keys

1	A	2	C	3	3	4	A	5	A	6	D	7	A
8	D	9	D	10	D	11	A	12	A	13	A	14	A
15	D	16	13	17	B	18	B	19	B	20	42	21	C
22	192	23	B	24	D	25	D	26	B	27	A	28	D
29	A	30	D	31	B	32	A	33	B	34	C	35	A
36	A	37	D	38	D	39	A	40	A	41	5	42	8
43	A	44	A	45	B	46	C	47	B	48	7	49	C
50	A	51	20.55	52	C	53	A	54	D	55	B	56	D
57	C	58	C	59	A	60	C	61	D	62	C	63	C
64	C	65	C										

Explanations:-

1.


2. i = 0   0 times
    i = 1   1 time
    i = 2   2 times j = 0, j = 1
    i = 3   3 times j = 0, j = 1, j = 1, j = 2
    i = n   n−1 times j = 0, j = 1, j = 2 … J = n − 1
    ∴ Total = 1 + 2 + 3+ …. + n − 1

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

3. For odd cycles, we require minimum 3 colours and for even cycles we require minimum 2 colours.
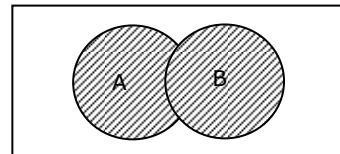
4. Diagonal relation is equivalence relation with minimum cardinality.

5 . If each node is adjacent to equal number of nodes (let us say k) then the degree of all the vertices in the graph are same (k) and this graph is called k-regular graph.

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6. $52 = 00110100; -52$ in 2's complement $= 11001100$

     Booth's recording pattern for 11001100 is 0-1 0 1 0-1 0 0

7. $f = A + \overline{A} . B$

     $= (A + \overline{A}) . (A + B)$

     $= A + B$

8.   Arithmetic shift left causes over flow when sign reversal occurs.

9    $(R_1 - 1)$ is $R_1 + 2$'s complement of '1'

     $R_1 = 1010$ 2's complement (0001) is 1111

     $\underline{1111}$

     1001

     For adding LSB bits we need one half adder as there won't be any carry and for adding remaining 3 MSB bits we need three full adders as there may be carry in those positions.

10.   Vertex covering number = minimum number of vertices to be taken to cover all the edges.
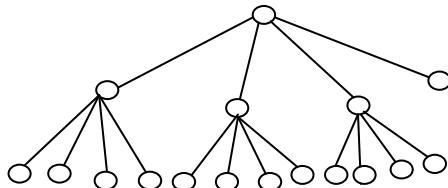
     Line or edge covering number = minimum number of edges to be taken to cover all the vertices.

11. $4p_3 \times 4! = 576$

12.   Regular expression for the language accepted by given DFA is $1^*0^+1(0+1)^*$

15.   SNMP port = 161; FTP (Data) port = 20; FTP (Control) = 21

     SMTP port = 25; HTTP port = 80; TELNET port= 23

16.
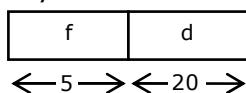
17.   By master's theorem case (i)
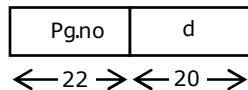
18.   Merge sort is not in-place sort

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20.   page size $= \dfrac{2^{25}}{2^5} = 2^{20}$

Physical address

f	d

$\longleftarrow 5 \longrightarrow \longleftarrow 20 \longrightarrow$

Number of entries = No of pages

Pg.no	d

$\longleftarrow 22 \longrightarrow \longleftarrow 20 \longrightarrow$

$LA = 22 + 20 = 42$

21.
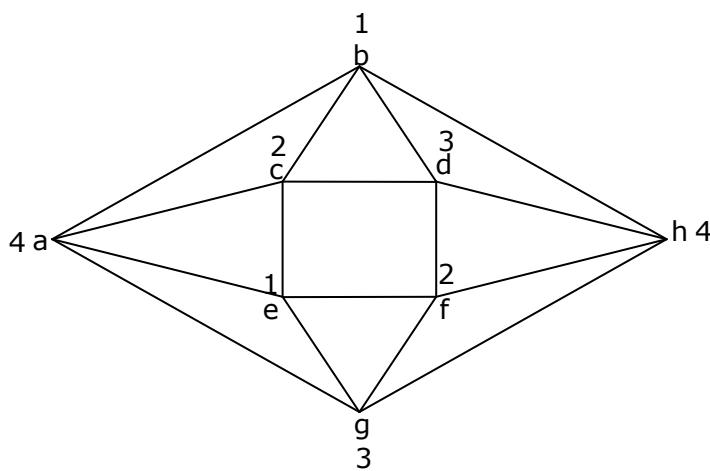
Protocol	Send window size	Receive window size
Stop-N-Wait	1	1
GBN	31	1
Selective-Repeat	32/2=16	32/2=16

22. $2^5 \times \left(2^3 - 2\right) = 192$

24.   (A) not in 2NF as $A \rightarrow C,\ C \rightarrow D$ are partial dependencies

(B) Candidate keys are AB and AC and not in 2NF because of the partial dependency $A \rightarrow D$

(C) Candidate keys are AB, BC and BD and it is in 3NF as there are no partial and transitive dependencies

25.   Head section is first section which will be loaded in the web browser.

26.

27. $\dfrac{^{10}C_7 \times (3)^7 (3)^3}{(6)^{10}} = \dfrac{(3)^{10} \times 10 \times 9 \times 8}{(6)^{10} \times 3 \times 2 \times 1} = \left(\dfrac{1}{2}\right)^{10} \times 120 = \dfrac{120}{1024} = \dfrac{15}{128}$

28. $a - a\bmod 10 = 0$ so reflexive

    a-bmod10=0 $\Rightarrow$ b-amod10=0 so symmetric

    a-bmod10=0; b-cmod10=0 $\Rightarrow$ a-cmod10=0 transitive

    It is also anti symmetric.

29. For 1ˢᵗ face we can choose any one of '5' colours

    For 2ⁿᵈ face we can choose any one of remaining '4' colours

    Similarly for 3ʳᵈ face $\rightarrow$ 3 ways

    4ᵗʰ face $\rightarrow$ 2 ways

    5ᵗʰ face $\rightarrow$ 1 way

    5. 4. 3. 2. 1 = 5! Ways.
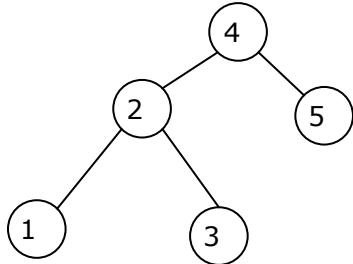
31. Host 1

    198 . 5 . 32 . 01011100

    255 .255.255.11000000 $\Rightarrow$ 198. 5. 32 . 01000000 = 198.5.32.64

    Host 2

    198 . 5 . 32 . 00101000

    255 .255.255.11000000 $\Rightarrow$ 198. 5. 32 . 00000000 = 198.5.32.0

32. 8–Bit representation of –108 in 2's complement is = 1001 0100

    When 8 – bit value is extended to 16–bit register, sign bit is copied on all MSB positions, so it becomes = 1111 1111 1001 0100

34. Interrupts will be executed according to their priorities; $I_2 > I_1$ and $I_3 > I_4 > I_1$

35.
10 15 4	25 4	9 25 4	16 4	 64

36. $[R]$ = Index register + address part ; 500 = 100 + address part; address part = 400

37. There can be a language which is not context sensitive but recursive enumerable (recursive enumerable languages are superset of context sensitive languages).

38. Grammar 'a' is not LL (1) because of left-recursion.

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39.

41. Apply binary search $\lceil \log_2 20 \rceil = 5$

42. No. of pages $= \dfrac{2^{30}}{2^{10}} = 2^{20}$; Number of entries for page table $= 2^{20}$

Let each entry contains X Bytes; $2^{20}.X = 2\,MBytes \Rightarrow X = 2\,Bytes$

Each entry is 16 bits; 3 bits are for book keeping 16 – 3 = 13 bits for frame number
Number of the frames $= 2^{13}$;
  Total memory $= 2^{13} \times 2^{10} = 2^{23} = 8\,M\,Bytes$

45. No extraneous attributes and no FD is redundant in the given FD set, hence its canonical cover is given FD set itself.

46. Inner query retrieves the salaries of all employees who are working in company "xyz", and outer query checks whether salary of the given employee is greater all the salaries retrieved by inner query, if that is the case then it will select that employee name.

49. Complexity of the given algorithm is $O(n\log_3 n)$

50. $1\,sec - 2 \times 10^6\,Bytes$; $1ms - 2 \times 10^3\,bytes$

1 byte - $\dfrac{1}{2 \times 10^3}$ ms

10 Kbytes - $\dfrac{10}{2}$ ms = 5ms

$T(t) -$ Transmission time of data packet – 5ms, Transmission time of acknowledgement = 0.05 ms.

T_P(propagation time of data packet) $= 10ms$

Utilization $= \dfrac{5}{[5 + 0.05] + 2(10)} = \dfrac{5}{25.05} = 19.96\% \cong 20\%$
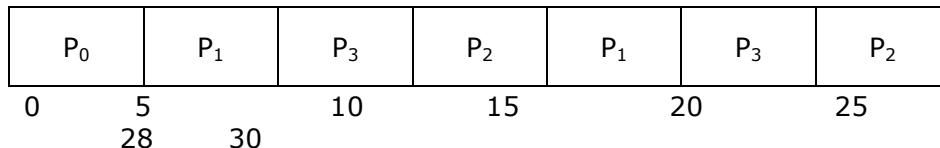
51. Latency $= T_t(Packet) + T_t(ACK) + RTT$ (T_t of 1 Kbyte packet= 0.5ms) = 0.5 + 0.05+ 20 = 20.55

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52.   <u>Need</u>   <u>Available</u>

	A	B	C	D
P_0	2	0	1	2
P_1	3	1	0	1
P_2	3	4	2	0
P_3	1	0	2	4

A	B	C	D
3	0	1	2
2	1	2	0
5	1	3	2
1	0	0	2
6	1	3	4
2	3	4	1
8	4	7	5
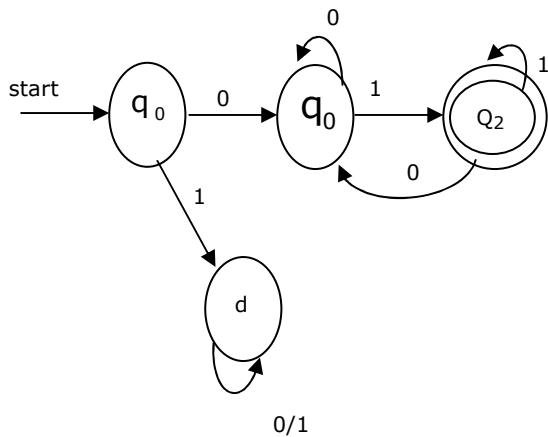
$< P_0, P_1, P_3, P_2 >$ be the safety sequence.

53.

P_0	P_1	P_3	P_2	P_1	P_3	P_2

0   5   10   15   20   25
        28   30

$$P_0 = 0 \Rightarrow P_1 = 5 + 10 = 15 \Rightarrow P_2 = 15 + 8 = 23 \Rightarrow P_3 = 10 + 10 = 20 \Rightarrow Avg = \frac{58}{4} = 14.5 \, ms$$

55.

57.   The two verbs of the main clause are in simple past tense and are joined with "and".

58.   Sedative induces drowsiness. Likewise anesthetic induces numbness.

59.   Veneration is respect and derision is lack of that

60.   Given that certain amount becomes five times after 3 years under compound interest. So after next 3 years it will be 5 times of the previous amount and so on.

End of the year	No. of times

6

3	5
6	$5(5) = 25$
9	$5(25) = 125$
12	$5(125) = 625$
15	$5(625) = 3125$

After 15 years the amount will be 3125 times.

61. Sum of n terms =
     $n^2 + 3n$

     sum of $(n-1)$ terms $= (n-1)^2 + 3(n-1) = n^2 + n - 2$

     Now we know n^{th} term = sum of n terms – sum of (n-1) terms

     Therefore n^{th} term in this case = $n^2 + 3n - (n^2 + n - 2) = 2n + 2$

     Therefore 6th term is $2 \times 6 + 2 = 14$

62. When we write down all the greater number of all distinct 2 element subsets, you
     will find that 8 gets written 7 times $\{(1,8), (2,8), (3,8,)(4,8), (5,6)(6,8)(7,8)\}$,

     7 gets written 6 times and so on. Hence the sum would be
     $8 \times 7 + 7 \times 6 + 6 \times 5 + 5 \times 4 + 4 \times 3 + 3 \times 2 + 2 \times 1$
     $= 56 + 42 + 30 + 20 + 12 + 6 + 2 = 168$

63. Every bounce is $\frac{3}{5}$ th of the previous drops in this movement. There are infinite
     GPs (the GP representing the falling distances and GP representing the rising
     distances). The required answer is
     $\dfrac{180}{1 - \frac{3}{5}} + \dfrac{108}{1 - \frac{3}{5}} = 720m$

64. i. $\dfrac{\text{B in 2011}}{\text{C in 2012}} = \dfrac{15}{55} = \dfrac{3}{11}$

     ii. Average $= \dfrac{10 + 15 + 40 + 40}{4} = \dfrac{105}{4} = 26.25$

     iii. Percentage increase in C $= \dfrac{30 \text{-} 15}{15} \times 100\% = 100\%$

65. That baseball injuries definitely *are* a result of weightlifting, might fix it.