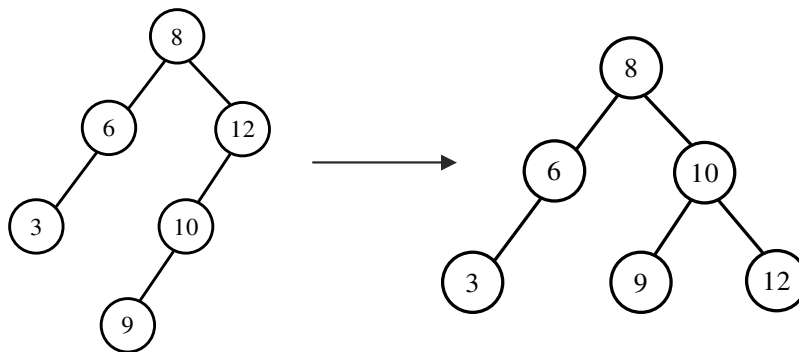


**Answer Keys**

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

**Explanations:-**

1.



2.  $i = 0$                       0 times  
 $i = 1$                       1 time  
 $i = 2$                       2 times  $j = 0, j = 1$   
 $i = 3$                       3 times  $j = 0, j = 1, j = 2$   
 $i = n$                        $n-1$  times  $j = 0, j = 1, j = 2 \dots j = n-1$   
 $\therefore$  Total =  $1 + 2 + 3 + \dots + n - 1$

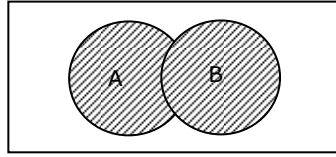
$$= \frac{(n-1)n}{2}$$

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.

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.  $f = A + \bar{A} \cdot B$   
 $= (A + \bar{A}) \cdot (A + B)$   
 $= A + B$



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

$$\begin{array}{r} 1111 \\ 1001 \\ \hline \end{array}$$

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.

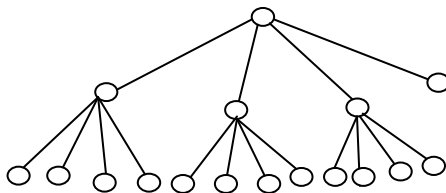
10. Vertex covering number = minimum number of vertices to be taken to cover all the edges.  
 Line or edge covering number = minimum number of edges to be taken to cover all the vertices.

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.

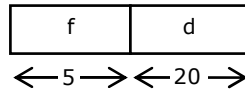


17. By master's theorem case (i)

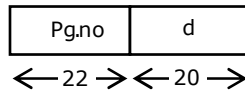
18. Merge sort is not in-place sort

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

Physical address



Number of entries = No of pages



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

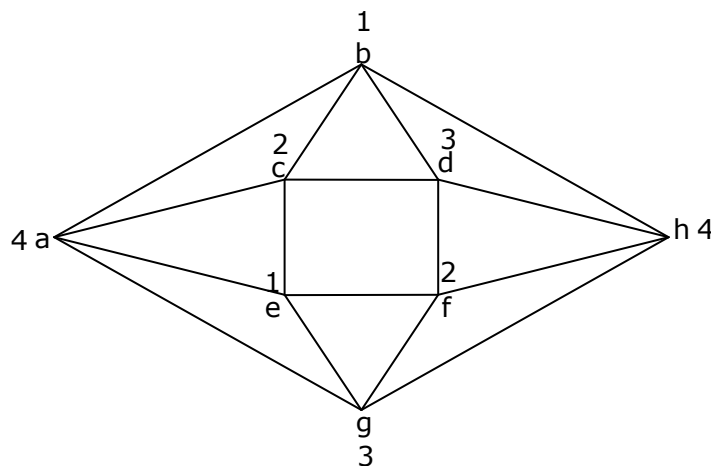
24. (A) not in 2NF as  $A \rightarrow C$ ,  $C \rightarrow D$  are partial dependencies

(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.



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

28.  $a - a \bmod 10 = 0$  so reflexive  
 $a - b \bmod 10 = 0 \Rightarrow b - a \bmod 10 = 0$  so symmetric  
 $a - b \bmod 10 = 0; b - c \bmod 10 = 0 \Rightarrow a - c \bmod 10 = 0$  transitive  
 It is also anti symmetric.

29. For 1<sup>st</sup> face we can choose any one of '5' colours  
 For 2<sup>nd</sup> face we can choose any one of remaining '4' colours  
 Similarly for 3<sup>rd</sup> face  $\rightarrow$  3 ways  
                     4<sup>th</sup> face  $\rightarrow$  2 ways  
                     5<sup>th</sup> 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

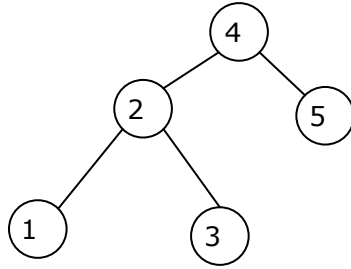
64
----

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

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.

39.



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

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

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

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 =  $2^{13} \times 2^{10} = 2^{23} = 8 \text{ M Bytes}$

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.  $1 \text{ sec} - 2 \times 10^6 \text{ Bytes}$ ;  $1 \text{ ms} - 2 \times 10^3 \text{ bytes}$

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

10 Kbytes -  $\frac{10}{2} \text{ ms} = 5 \text{ ms}$

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

$T_p$ (propagation time of datapacket) = 10ms

Utilization =  $\frac{5}{[5 + 0.05] + 2(10)} = \frac{5}{25.05} = 19.96\% \approx 20\%$

51. Latency =  $T_t(\text{Packet}) + T_t(\text{ACK}) + \text{RTT}$  ( $T_t$  of 1 Kbyte packet = 0.5ms) =  $0.5 + 0.05 + 20 = 20.55$

52. Need Available

	A	B	C	D	A	B	C	D
$P_0$	2	0	1	2	3	0	1	2
$P_1$	3	1	0	1	2	1	2	0
$P_2$	3	4	2	0	5	1	3	2
$P_3$	1	0	2	4	1	0	0	2
					6	1	3	4
					2	3	4	1
					8	4	7	5

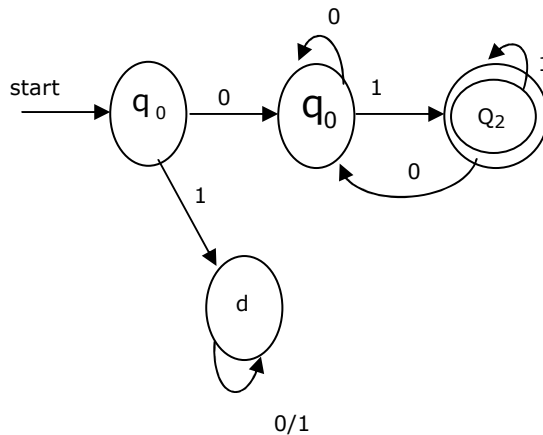
$\langle P_0, P_1, P_3, P_2 \rangle$  be the safety sequence.

53.

$P_0$	$P_1$	$P_3$	$P_2$	$P_1$	$P_3$	$P_2$
0	5	10	15	20	25	
	28	30				

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

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
-----------------	--------------

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 =

$$n^2 + 3n$$

$$\text{sum of } (n-1) \text{ terms} = (n-1)^2 + 3(n-1) = n^2 + n - 2$$

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

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

$$\text{Therefore } 6^{\text{th}} \text{ term is } 2 \times 6 + 2 = 14$$

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

$$\frac{180}{1 - \frac{3}{5}} + \frac{108}{1 - \frac{3}{5}} = 720\text{m}$$

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

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

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

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