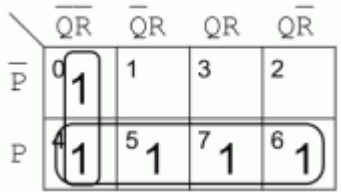
1. Ans. D
LHS = $(\sqrt{3} + \sqrt{7})^2 = (\sqrt{3})^2 + 2*\sqrt{3}*\sqrt{7} + (\sqrt{7})^2$
$= 3 + 2*\sqrt{21} + 7$
RHS = $10 + 2\sqrt{21}$
Now LHS will be $(\sqrt{10})^2 = 10 < 10 + 2\sqrt{21}$
So, $\sqrt{3} + \sqrt{7} > \sqrt{10}$
2. Ans. C
Consider the series $S(n)= 3+6x^2+9x^4+12x^6+\ldots$
$-x^2\ S(n)=-3x^2-6x^4-9x^6-\ldots$
$(1-x^2)\ S(n)=3+3x^2+3x^4+3x^6+\ldots$
$(1-x^2)\ S(n)=3(1+x^2+x^4+x^6+\ldots)$
$(1-x^2)\ S(n)=3\times1(1-x^2)$
So we see that $S(n)=3/(1-x^2)^2$
3. Ans. C
Consider $f(x) = \sqrt{1+x}$
$\Rightarrow f'(x) = 1/2\ \sqrt{1+x}$
$g(x) = \sqrt{1-x}$
$g'(x) = 1/2\sqrt{1-x}$
Now lim x--> 0 $[(\sqrt{1+x} - \sqrt{1-x})/x]$
$= [f'(x)/g'(x)]$ for x=0
$\Rightarrow [1/2\ \sqrt{(1+x-1+x)}\ /1$ for x =0
$\Rightarrow [1/\ 2\ \sqrt{2}]\ /\ 1$
$\Rightarrow 1$
4. Ans. B
It is noted that a group G is Abelian if and only if $(ab)^{-1} = a^{-1}b^{-1}$ for all a, b in G
5. Ans. B
As per Euler's Theorem, in case of connected multi-graph G, G is said to be Eulerian if and only if every vertex has even degree.
6. Ans. B
We see in a graph having n vertices, an edge can be drawn from vertex to n-1 vertex which is not applicable in case of n vertices, so total number of edges will be n(n-1). Since every edge is counted twice, then the required maximum number of edges will be n(n-1)/2
7. Ans. A
It is 0 as after simplifying we get A(1+B'+B'C), as an expression when ordered with 1 gives value as 1, so it is zero
8. Ans. A
2 switch a,b in series =a.b
2 switch a,b in parallel=a+b
so above circuit diagram gives expression
A(B+C)+AB+(A+B)C
=AB+AC+AB+AC+BC=AB+AC+BC Option A is Correct
9. Ans. C
Considering truth table of half subtract or

A	B	D(A-B)	X(Borrow)
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

We see for values of A and B where D and B are 1
D=A'B+AB' or A⊕B
X=A'B
Hence D=A'B+AB', X=A'B is correct
10. Ans. B
On considering the output of above circuit we see that
=w' + w'z + z'xy----(1)
If we remove or short the 2nd gate, then the output will be:
= w' +z'xy =w' (1+z) + z'xy
=w' +z'xy ---------(2)
Since both will give similar output, then we see that Gate No. 2 is redundant
11. Ans. C
Dynamic hazard is possibility of change output if done more than once due to single input change. Such logic hazards are subsets of problem where change in input variables does not change output with similar delay due to NOT, AND, OR gates.
12. Ans. B
Gray code as
X1=Y1, X2=Y1 XOR Y2 X3=Y1 XOR Y2 XOR Y3
For

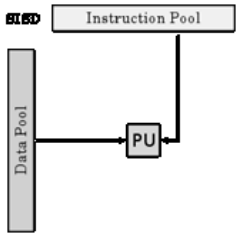
Y1	Y2	Y3	X1	X2	X3
0	0	0	0	0	0
0	0	1	0	0	1
0	1	0	0	1	1
0	1	1	0	1	0

13. Ans. A
In the above circuit when an input is 0 then output is 1 which further which will feedback to circuit again and results in 0 output. Hence we see that the output/input results as 0-1-0-1.... that is a case of square wave. Now we see that when an input is 1 then output/input results as 1-0-1-0....
14. Ans. D
Considering $12A7C_{16}$
$=(0001001010100111100)_2$
$=(0001001010100111100)_2$
=225174
15. Ans. C
The Excess-3 code is self complementing where l's complement of Excess- 3 number is Excess- 3 code for the 9's complement of corresponding decimal number.
16. Ans. B
We see that
(P + Q' + R') * (P + Q'+ R) * (P + Q + R')
= π(3,2,1) = Σ (0,4,5,6,7)
Now from karnaugh map as shown, we have (P + Q'.R')



17. Ans. C
a)1010
2's complement = 0110
b)0101
2's complement = 1011
c)1000
2's complement = 1000
d)1001
2's complement = 0111
Hence Option **(c)1000** is the correct choice.
18. Ans. C
JK flip-flop accepts both inputs as 1 and returns a toggle state. When initial state is q, then output is complement of q where in SR flip-flop, output is invalid state when inputs are set to 1
19. Ans. A
We see that Speedup = $ExecutionTime_{Old}$ / $ExecutionTime_{New}$
$ExecutionTime_{Old} = CPI_{Old} * CycleTime_{Old}$
We see that CPI is Cycles Per Instruction, so
$CPI_{Old} * CycleTime_{Old}$
= 4 * 1/2.5
= 1.6 ns
As there exists no stalls, the CPU_{new} be assumed as 1
Now, $ExecutionTime_{New} = CPI_{new} * CycleTime_{new}$
= 1 * 1/2
= 0.5
Hence the speedup = 1.6 / 0.5 = 3.2
20. Ans. A
correct answer is A :- 5 5 5
21. Ans. A
Initially we see that capacity of the disk will be:
16 surfaces X 128 tracks X 256 sectors X 512 bytes
= 256 Mbytes.
Now number of bits needed to access a sector, so finding total number of sectors as:
= 16 surfaces X 128 tracks X 256 sectors
= 2^{19}
Hence number of bits required to access a sector is 19
22. Ans. B
Let P be the page fault rate, so Effective Memory Access Time will be:
= p * (page fault service time) + (1 - p) * (Memory access time)
= (1/(10^6))* 10 * (10^6) ns + (1 - 1/(10^6)) * 20 ns
= 29.9 = 30 ns
23. Ans. C
Register renaming is a technique which eliminates false data dependencies arising from reuse of architectural registers by successive instructions that do not have any real data dependencies between them.

24. Ans. A
Flynn's taxonomy is a classification of computer architectures, proposed by Michael J. Flynn in 1966 which is based on Single Instruction, Single Data stream (SISD) class.



25. Ans. C
If we short a=320; then in binary
HB LB

00000001 01000000

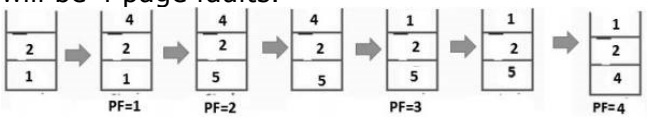
Now as per Little-ending, LSB value is at lowest address while other bytes are in increasing order of significance.
Also
ptr=(char *)&a;
where a is type casted to char, hence as per Little ending, LSB value will be at lowest address, so pointer will stored as LA 01000000. hence when printf is executed, it prints 64.
26. Ans. D
Consider n = 1, n = 3
When n=5 we have:
1 <= 5 (T)
2 <= 5 (T)
4 <= 5 (T)
8 <= 5 (F)
$(\log_2 n)+1$
= $(\log_2 5) + 1$
= (2.5) + 1
27. Ans. A
For finding any postfix expression, we see that as there are input tokens left, in such case you have to read the next token from input. If the token is a value, then push it on stack or else token will be an operator. It is known a priori that the operator takes n arguments. If there are fewer than n values on the stack, then user will not have required values in the expression. Then pop the top n values from the stack and find the operator with values as arguments and push the returned results back onto stack. Also, when there is only one value in stack, then the value is the result of calculation. When there are more values in stack, user input contains many values.
28. Ans. C
Average number of comparisons in sequential search is n+1/2 where n is size of array. When element is in 1^{st} position, then number of comparisons will be 1 and when element is in last position, then number of comparisons will be n.

29. Ans. C
We see that f(37)=37 mod 7 =2
Hence,37 is kept in location 2. f(38)=3, so 38 will be in third location.
Now F(72)=2, which is linear probing as collision resolving strategy with linear probing inserts keys 37, 38, 72, 48, 98, 11, 56 in table indexed from 0 to 6 thereby storing 11 in 5^{th}location
30. Ans. D
When all non-leaf node in binary tree has non empty left and right subtree, then it is a binary tree. In this, every nodes are of degree 0 or 2 and not 1. A strictly binary tree with N non leave nodes contains 2N+ 1 nodes.
31. Ans. C
It is noted that we always divide subset of original set in half and sort elements as per greater than arbitrary chosen element and as per less than arbitrary chosen element before working same algorithm on both halves.
32. Ans. A
In rewinding process, first element in input will move towards the last and process it then again comes back to initial position of input using turning machine. It is seen that the process in FSM where input will move from left to right one by one and cannot be rewinded.
33. Ans. B
A is incorrect because it cannot accept "110"
C is incorrect because it accept a string with single 1.
D is incorrect because it cannot accept 11101
34. Ans. B
$T(n)=2T(n^{1/2})+1$-----(1)
$(n^{1/2})=2T(n^{1/4})+1$----(2)
put 2 in 1
$=2^2T(n^{1/4})+2.(1)$
$=2^kT(n^{1/(2)^k})+k.1$-----(3)
here
suppose $(n^{1/2^k})=1$
$2^k=\log n$
$k=\log \log n$
from 3=>
$=\log n .C +\log \log n .1$
$T(n) = \ominus(\log n)$..
35. Ans. B
1. **True.** G is ambiguous. E.g. the string abab has multiple derivation trees like S→SS→abS→ab, and S→ab.
2. **False.** G can produce all strings with equal no. of a`s and b`s. (aabb cannot be generated).
3. **True.** The given grammar G generates the language $(ab+ba)*$, which is Regular and therefore also DCFL. So, a D-PDA can be designed for G.

Hence, the answer is option **B**.

36. Ans. D
if L is recursively enumerable that means a TM accepts all strings which in L. L^- is recursively enumerable means a TM so accepts all strings in L^-. So, we can always decide if a string is in L or not, making L recursive.
37. Ans. B
We see that the strings accepted by language can be {a, b, aaa, bbb, aba, bab, ..} which are odd length palindromes.
when S –> aSa- 1st
S -> bSb -2nd
S-> a| b -3rd
now produce
when we put in a in 1st then it produce = aaa this will odd lengeth
38. Ans. D
We see that languages generated by Type 3 grammar are Regular languages where rules have restriction as they are of form: A->a or A->aB that shows each non-terminal should produce 1 terminal symbol. So we see that it is a Type 3 as all these grammar satisfying the rules of type-3 grammar.
39. Ans. B
We see that Linear list has O(n/2) linear complexity. Search tree on average O(logn) will have logarithmic complexity and Hash table where perfect hashing leads to O(1) with fixed complexity.
40. Ans. A
Recursive descent is a top-down parsing technique that constructs the parse tree from the top and the input is read from left to right.
41. Ans. C
We see that top down parser is LL parser where Left to Right parsing is done using Left most derivation(LL) and bottom up parser is carried using LR parser with Left to Right parsing performing Right Most Derivation in reverse order (LR)
42. Ans. B
Relative mode addressing is most relevant to writing a position-independent code.
43. Ans. D
An assembler is a translator which translates an assembler program into a conventional machine language program.
44. Ans. B
It is a form of local optimization that is done on a segment of generated code.
45. Ans. A
We see that in this, P shows Wait and V shows Signal. Now P operation will decrease the value semaphore by 1 all time V operation will increase value of semaphore by 1. Now we have value of counting semaphore as 7, then 20 p operation will reduces to -13. Then to increase value to 5, we require 18 V operations, so value of x=18

46. Ans. D
Deadlock doesn't occurs with a single resource
47. Ans. A
We see that when a system is in deadlocked, then all process will carry single resource and is waiting for another. As there are 3 processes and 4 resources, so 1 process should get 2 resources, so process will not need more resources and therefore it will return its resources when done.
48. Ans. C
As the reference string is 1,2,4,5,2,1,2,4, so if LRU Page replacement algorithm is applied then there will be 4 page faults.



49. Ans. D
Working set is a concept that shows amount of memory which is required by the process in given time interval. It is the set of pages used by k most recent memory references. The function w(k, t) is the size of the working set at time t.
50. Ans. C
We see that size of a page will be = 4KB = 2^{12}
No total number of bits required to address page frame will be 32 – 12 = 20. When there are n cache lines in set, cache placement is n-way set associative. Since TLB is 4 way set associative and can hold total 128 (2^7) page table entries, number of sets in cache = $2^7/4 = 2^5$. Hence, 5 bits are needed to address a set and 15 bits are needed for tag.
51. Ans. C
From the above options, preemptive scheduling is good for Real-Time Programming as this allows real-time process to prevent current process running in Kernel. Preventive Kernel is responsive as there is low risk as compared to Kernal-mode process that runs randomly for long before giving up processor to wait for process. Also, real-time systems needs results be produced in particular deadline.
Round Robin Scheduling is used in Time Sharing Systems. (for this we can refer as Galvin)
52. Ans. A
We see that Belady's variance confirms that it is possible to have many page faults while increasing number of page frames when using First in First Out page replacement algorithm.
53. Ans. B
mn
Case 1: if there is a common attribute between R and S, and every row of r matches with the each row of s- i.e., it means, the join attribute has the same value in all the rows of both r and s
Case 2: If there is no common attribute between R and S.
0 There is a common attribute between R and S and nothing matches- the join attribute in r and sshave no common value.
So ans Is B.
54. Ans. B

R		
a	b	c
S1	—	—
S2	—	—
S3	—	—

S		
d	e	f
S1	—	—
S2	—	—

In an example, we see that d being foreign key of S while a being primary key of R, we see that while insertion into R, there result no violation since it gives no inconsistency. While insertion in S, it causes violation since there are entry of tuple in relation R as <S4,-,-> is not valid since there is no S4 tuple in relation R which lead to inconsistency. While deletion from R, we see that it results in violation as deletion of tuple <S2,-,-> causes violation because of entry of S2 in foreign key table thereby resulting in inconsistency. While deletion from S, it causes no violation because of inconsistency.
55. Ans. D
The outer query selects all titles from book table. For every selected book, the subquery returns count of those books which are more expensive than the selected book. The where clause of outer query will be true for 5 most expensive book. For example count (*) will be 0 for the most expensive book and count(*) will be 1 for second most expensive book.
56. Ans. D
Database's logical schema is a logical plan developed using diagrams showing content of database tables which describes linking of tables for data access. In this, initially during logical design, conceptual model is framed as per assessment. This conceptual model is Entity Relation diagram showing tables, fields, and primary keys of database and table linkages.
57. Ans. C
We noted that the six operators of relational algebra are selection(σ), projection(π), Cartesian product (x), set union (U), set difference (-) and rename (p) are basic as none of them can be ignored without losing expressive power. Among the important are set intersection, division, and natural join where aggregation is not possible using basic relational algebra operations. Hence, it is difficult to run the sum of total employees salaries using six operations.
58. Ans. D
A statement that is executed automatically by the system as a side effect of modification to the database

59. Ans. B
We see that Disk Block size is 1024 bytes while Data Record Pointer size, r is 7 bytes, Value size V is 9 bytes and Disk Block ptr P is 6 bytes. Now, assume that the order of leaf be m. So in case of leaf node in B+ tree, there are m record pointers where m values with 1 disk block pointer is present. Hence r*m + V*m + p <= 1024, so 16m <= 1018, then m =< 63.625 = 64
60. Ans. A
We see that there are many types of ordered indexes where primary index is specified as per ordering key field of ordered file records. In an ordering key field, we have to order physically the file records on disk which carries unique value. When an ordering field is not key field, then many records in file can have similar values for ordering field that can be clustering index. Here data file is clustered file where a file carries at most single physical ordering field having at most single primary index or clustering index, but not both.
61. Ans. B
From the above options, robustness is quality of computer system to handle errors at the time of execution with incorrect input.
62. Ans. D
The requirements mentioned in the options are all non-functional requirements which describes quality of system and not the working and purpose of software.
63. Ans. B
Configuration management relates to work of tracking and controlling changes in software which cannot avoid any change in software or related document, so it is not concerning with hardware
64. Ans. B
We see that LOC of L1=x, so LOC of L2=2x
Now, (x/10000)*1000000 + 5*100000
= (2x/10000)*750000 + 5*50000
So, by solving x, we get x =5000
65. Ans. A
Effort Applied(E) = $a1 \times (KLOC)^{a2}$
KLOC = LOC/1000 = 20000/1000 = 20
Effort Applied (E) = $2.2 \times 20^{1.5}$ = 196.77
66. Ans. D
In spiral modal of software development, the main determinant in selecting activities in every iteration is risk.
67. Ans. A
Bit stuffing is applied in case when there appears a flag of bits showing incidents like start of frame, end of frame, etc, In case if similar flag of bits appear in data stream, zero can be inserted which is deleted from data stream.
68. Ans. D
Dynamic routing shows capability of system where routes are characterized by destination which changes the path of route through system in response to change in conditions. Routers which uses adaptive protocols to avoid bridge loops and routing loops evaluate a tree showing best link for packet to get to its destination.
69. Ans. C
We see that in ethernet CSMA/CD, special bit sequence is transmitted by media access management to handle collision which is known as Jam signal.
70. Ans. A
In case of ARP, Address resolution Protocol is applied to convert Ip address to MAC address whose reply is Unicast. it can applied when a Host requires to find MAC address of another Host, a Host finds MAC address of Router, a Router finds MAC address of another Router and also when Router needs to get MAC address of Host. The RARP which is Reverse ARP, that converts MAC address to Ip address. The Boot P runs on Application Layer where request for asking Ip address comes from Application Layer. The DHCP is Dynamic Host Configuration Protocol that is applied on non static table and is applied by many ISP where we don't have private Ip address
71. Ans. C
We see that transmission delay for single bit:
$t = 1/(10^7)$
= 0.1 micro seconds.
Now, if 200 meters is traveled in 1 micro second, then in 0.1 micro seconds 20 m will be traveled
72. Ans. C
We see that maximum subnets will be 2^6-2 =62. If 2 is subtracted from 2^6, then RFC 950 specification reserves subnet values having all 0 and 1 thereby reducing number of available subnets by 2. In such case, the maximum hosts will be 2^{10}-2 = 1022. Also, if 2 is subtracted for it, then address having all bits as 1 gets reserved as broadcast address while address with host ID bits reserved as 0. Normally, number of address used for addressing particular hosts in all network will be 2^N-2.
73. Ans. B
We see that the polynomial x^3+1 corresponds to divisor will have 1001, so:

```
11001001 000  <--- input right padded by 3 bits

1001        <--- divisor

01011001 000  <---- XOR of the above 2

1001        <--- divisor

00010001 000

  1001

00000011 000

    10 01

00000001 010

     1 001

00000000 011 <------- remainder (3 bits)
```

Now after dividing the message 11001001 by 1001, we see that remainder will be 011 which is CRC, so data transmitted will be message + CRC ie 11001001 011

74. Ans. A

We that the application layer can send data of any size without any limitation, so a lower layer will divide the data when it is required.

75. Ans. D

We see that the transmission delay for single frame will be $1000/(10^6) = 1$ ms. Since the propagation time is 25 ms, so the sender max can transfer 25 frames before first frame reaches its home. Hence the number of bits required for showing 25 different frames will be 5.

76. Ans. C

We see that SGML which is standard generalized markup language forms the derivates of xml and html. Both xml and html shows layout and content and are limited applicable with web browsers, but xml allows user defined tags while HTML doesn't.

77. Ans. C

Initially we will see the system in cache 1. If the system is not available in cache 1, then look for it in cache 2 and then in main memory. In this, average access time have to be considered in cache 1 and if it is failure in cache 1 and success in cache 2 while failure in cache 1 and 2 but success in main memory.

So we see that average access time = [H1*T1]+[(1-H1)*H2*T2]+[(1-H1)(1-H2)*Hm*Tm]

Here, H1 = Hit rate of level 1 cache which is 0.8, T1 = Access time for level 1 cache which is 1 ns, H2 = Hit rate of level 2 cache which is 0.9, T2 = Access time for level 2 cache which is 10 ns, Hm = Hit rate of Main Memory which is 1 and Tm = Access time for Main Memory which is 500 ns. Now we will calculate the average access time as:

[H1*T1]+[(1-H1)*H2*T2]+[(1-H1)(1-H2)*Hm*Tm]

= (0.8 * 1) + (0.2 * 0.9 * 10) + (0.2 * 0.1 * 1 * 500)

= 0.8 + 1.8 + 10

= 12.6 ns

78. Ans. D

We see that member functions and data members of class C will have access to public and protected member of class A and B when both A and B are publicly inherited.

79. Ans. C

We see that C language supports only Early Binding where every functions related to function calls gets resolved at compile time. Also, C++ language has Early Binding and Late Binding where late binding is process that resolves the functions related to function calls at the time of run time. So in C++ language, virtual calling is resolved at run-time.

80. Ans. C

In DNS lookup, DNS record gets returned from DNS server. The DNS Hijacking mislead user to other website and does not attempt to fool user about URL. It grabs every user information by redirecting user to different site. In DNS Spoofing, user is cheated with URL and gets directed to lookalike fraudulent website.

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