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GATE CS 2020 MEMORY BASED PAPER

Except for the Aptitude section this paper is not easy at least..

If you find any corrections, Please feel free to reach out to us: gatecse@appliedcourse.com. We will look into the query and get back to you.

1. Select the word that fits the analogy
   Cook : Cook : : Fly : [Mark 1]

   a. Flying
   b. Flyer [ANS]
   c. Flighter
   d. Flew

   Explanation: Cook (verb) : Cook (noun: a person who prepares and cooks food, especially as a job or in a specified way)
   Hence for Fly (verb) : Flyer (noun)

2. His knowledge of the subject was excellent but his classroom performance was _____.
   [Mark 1]

   a. good
   b. extremely poor [ANS]
   c. desirable
   d. Praiseworthy

3. Raman is confident of speaking English _____ 6 months as he has been practicing regularly _____ the last 3 weeks. [Mark 1]

   a. within, for [ANS]
   b. for, since
   c. for, in
   d. during, for

4. Goods and service tax (GST) is an indirect tax introduced in India in 2017 that is imposed on the supply of goods and services used, and it subsumes all indirect taxes except a few. It is a destination based tax imposed on goods and services used , and it is not imposed at the point of origin from where goods come.

GST also has few components specific to state government, central government and UT's?

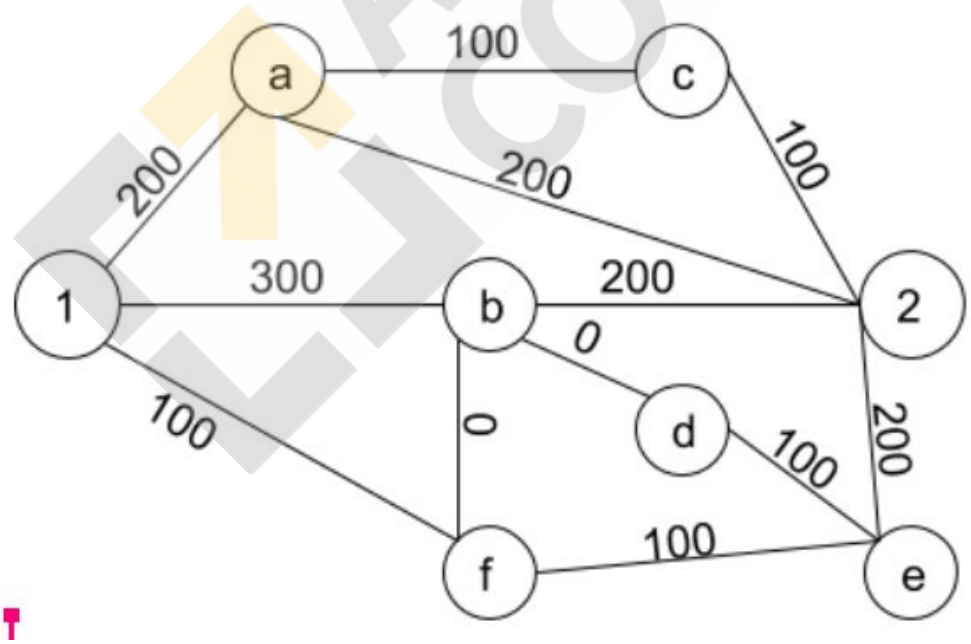
Which one of the following can be inferred from the given passage?

[Mark 1]

a. GST includes all indirect taxes
b. GST is imposed on the production of goods and services.
c. GST imposed at point of usage of goods and services. [ANS]
d. GST does not have a component specific for UT's.

5. There are multiple routes from node 1 to node 2. There are 6 toll booths on the way named as a, b, c, d, e and f. The cost of travelling through the paths are mentioned in the figure. The charges at toll booth a and e are Rs 200 and Rs 100 at the others. Find the cheapest route to travel from node 1 to node 2.

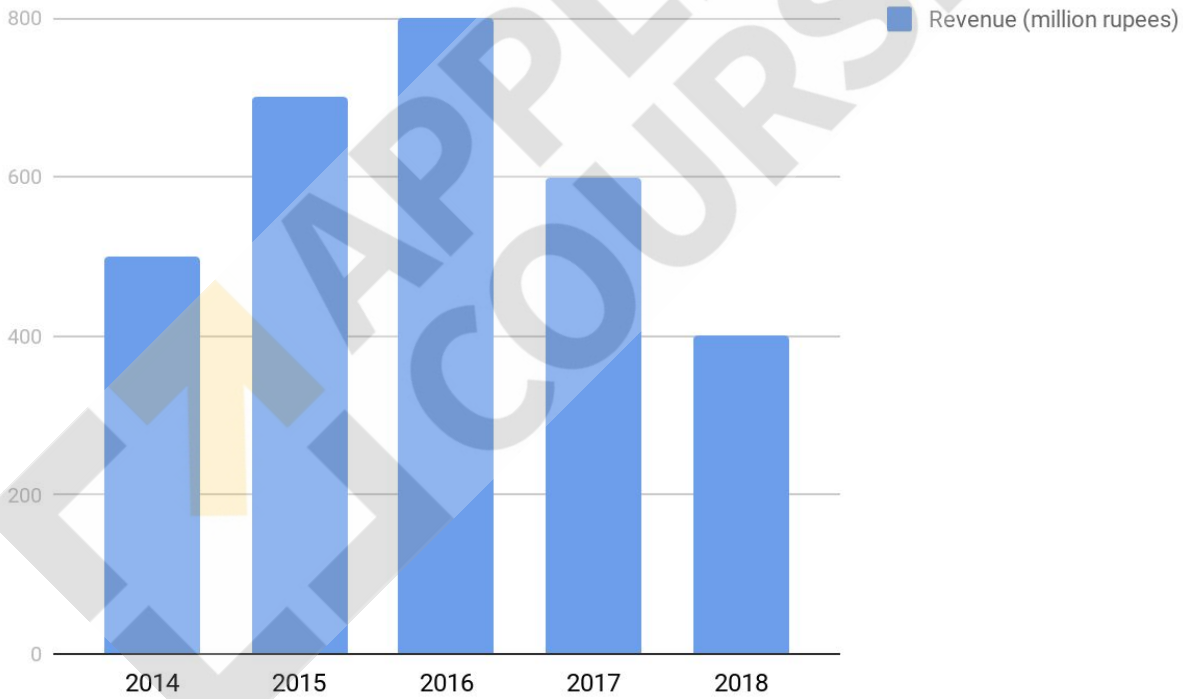
[Mark 1]



a. 1-a-c-2
b. 1-f-e-2
c. 1-f-b-2 [ANS]
d. 1-b-2

Explanation: 1-a-c-2 = 200+200+100+100+100=700
1-f-e-2 = 100+100+100+200+200=700
1-f-b-2 = 100+100+0+100+200=500
1-b-2 = 300+100+200=600

6. The total revenue of a company during 2014 - 2018 is shown in the bar graph. The total expenditure of the company in each year is 500 million rupees. The aggregate profit/loss (in percentage) on the total expenditure of the company during 2014 - 2018 is _____ . [Marks 2]



a. 16.67% loss
b. 20% loss
c. 16.67% profit
d. 20% profit [ANS]
Explanation: Total Expenditure = 500 * 5 = 2500
Total Revenue = 500+700+800+600+400 = 3000
Total Profit = 3000 - 2500 = 500

Profit (%) = (500/2500)*100 = 20%.

7. If P = 3, R = 27 and T = 243, then find Q+S ? [Marks 2]

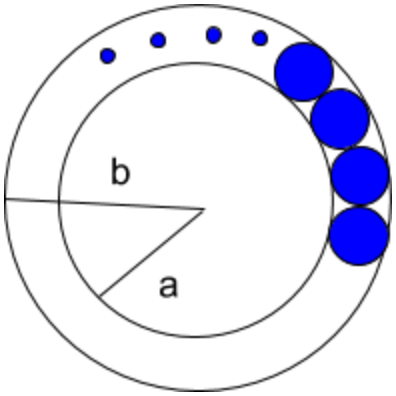
   a. 90 [ANS]
   b. 110
   c. 80
   d. 40

   Explanation: P Q R S T
   3 27 243
   Here we can see that 3^1 = 3
   Then, 3^2 = 9
   Then, 3^3 = 27
   Then, 3^4 = 81
   And 3^5 = 243

   Hence, Q + S = 9 + 81 = 90

8. Two straight lines are drawn perpendicular to each other in XY Plane. If α and β are the acute angles the straight line make with the X-axis, then $\alpha + \beta$ is _____. [Marks 2]
   a. 180°
   b. 120°
   c. 60°
   d. 90° [ANS]

9. The figure below shows an annular ring with outer and inner radii b and a respectively. The annular space has been painted in the form of a blue color circle touching the outer and inner peripheral of annular space. If a maximum of n number of circles can be painted then the unpainted area available in annular space is _____. [Marks 2]



a. $\pi[(b^2 - a^2) - \frac{n}{4}(b-a)^2]$ **[ANS]**

b. $\pi[(b^2 - a^2) + n(b-a)^2]$

c. $\pi[(b^2 - a^2) - n(b-a)^2]$

d. $\pi[(b^2 - a^2) + \frac{n}{4}(b-a)^2]$

TECHNICAL

1. Which of the following statements is/are True [Mark 1]

   I. If L_1 U L_2 is Regular, then L_1, and L_2 are also regular languages

   II. Infinite union of regular languages are also regular

   A. I only

   B. II only

   C. Both I and II

   D. Neither I nor II [ANS]

Answer:D

Explanation:

If L_1 U L_2 is Regular, then L_1, and L_2 are also regular languages: False

Infinite union of regular languages are also regular: False

2. Consider the following grammar [Mark 1]

S→ aSB | d

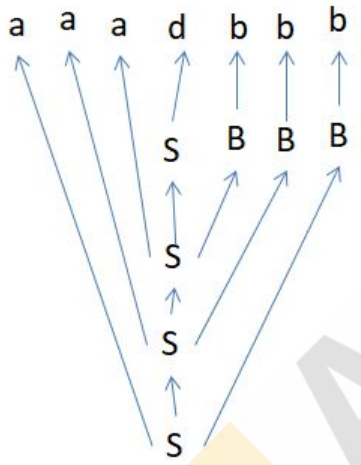
B→ b

Then the number of reductions in the bottom up parser for parsing the input aaadbbb

Is_____

Answer: 7

Given input string is aaadbbb



Total number of steps/reductions in the derivation is 7

3. Which of the following is the Regular expression represents set of all binary strings having odd number of 1's over {0, 1} [Mark 1]

A. 10*(0*10*10*)*

B. (0*10*10*)*10* [ANS]

C. (0*10*10*)*0*1

D. ((0+1)*1(0+1)*1)*0*1

Answer:B

Explanation:

1*0(0*10*10*)* Every string Starts with 1 and contains an odd number of 1's.

(0*10*10*)*10* Most suitable answer for the given problem according to the given options.

(0*10*10*)*0*1 Every string ends with 1 and the number of 1's in the string is odd

((0+1)*1(0+1)*1)*0*1It contains an even number of 1's also.

4. Consider the following language

L= $\{a^n \mid n \geq 0\}$ U $\{a^n b^n \mid n \geq 0\}$

Then which of the following is/are True [Mark 1]

I. Deterministic context free language
II. Context free but not deterministic context free
III. L is not LL(k) for any k

A. I and III Only [ANS]

B. I and II only

C. I, II and III

D. II and III Only

Answer:A

Explanation:

L= $\{a^n \mid n \geq 0\}$ U $\{a^n b^n \mid n \geq 0\}$

⇒ L = { ε ,a, aa, aaa, b, bb, ab, aabb,.....}

We can construct a deterministic context free grammar and DPDA for the language.

The grammar for the given language is

S→ aSb | A

A→ aA | ε

Which is not LL(1) as it contains First(S) ={ a} U First (A) ≠ Φ

5. Which of the following is/are True [Mark 1]

I. Symbol table can be accessed only in Lexical analysis and Syntax analysis
II. Programming languages which support recursion need to have heap data structures in Runtime environment

III. The errors like "variables must be declared before its use" will be recognized in syntax analysis.

A. Neither I,II and III [ANS]

B. II and III only

C. II only

D. I and III only

Answer:A

Explanation:

Symbol table can be accessed only in Lexical analysis and Syntax analysis

False: We can access the symbol table throughout all the phases of compilation.

Programming languages which support recursion need to have heap data structures in Runtime environment

False

The errors like "variables must be declared before its use" will be recognized in syntax analysis.

False: Will be identified in the semantic analysis phase of the compiler

6. Which of the following is/are Context free [Marks 2]

I. $L = \{wxyx \mid w,x,y \in \{0+1\}^+\}$

II. $L = \{xy \mid x,y \in \{0+1\}^*$ and $|x| = |y|$ and $x \neq y\}$

A. Both are context free

B. I only

C. II only

D. Neither I nor II

Answer: A

Explanation:

$L = \{wxyx \mid w,x,y \in \{0+1\}^+\}$ CFL

Let x=0, w0y0 $(0+1)^+0(0+1)^+0$

x=00, w00y00 $(0+1)^+0(0+1)^+0$

x=10 w10y10 $(0+1)^+0(0+1)^+0$

RE is $(0+1)^+0(0+1)^+0 + (0+1)^+1(0+1)^+1$

L = {xy | x,y ∈ {0+1}* and |x| = |y| and x ≠ y}CFL
We observe that a string is in C if and only if it can be written as xy with |x| = |y| such that for some i, the ith character of x is different from the i^{th} character of y. To obtain such a string, we start generating the corresponding i^{th} characters, and fill up the remaining characters. Based on the above idea, we define the CFG for C is as follows:
S → AB | BA
A → XAX | 0
B → XBX | 1
X → 0 | 1

7. Which of the following is/are Undecidable [Marks 2]
   I. { <M> | M is a TM with L(M) = ∅ }
   II. { <M,w> | M will take for the string w exactly 100 steps}
   III. { <M> | M is not recursive}
   IV. { <M> | M contains at least 20 members}
   A. I, III and IV only [ANS]
   B. II and III only
   C. III and IV only
   D. I and IV only

Answer: A
Explanation:
{ <M> | M is a TM with L(M) = ∅ } Emptiness of recognizable languages are undecidable
{ <M,w> | M will take for the string w exactly 100 steps}Decidable
After 100 steps ™ will halt for both the valid and invalid inputs.

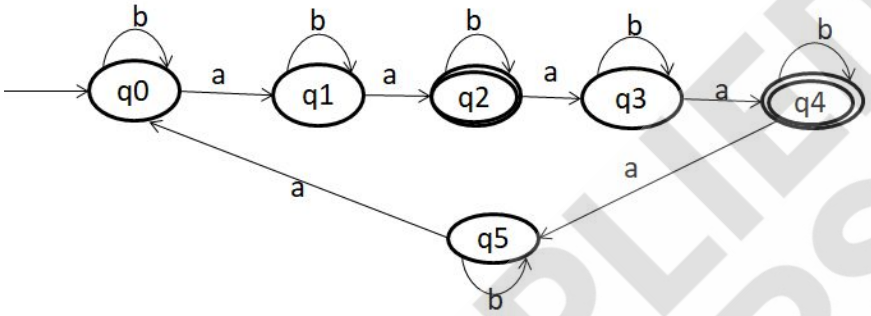
{ <M> | M is not recursive}Undecidable

{ <M> | M contains at least 20 members}Membership problems of recognizable language are undecidable.

8. Minimum number of states in a DFA that accepts language contains number of a's are divisible by 2 but not by 3._____ [Marks 2]

Answer: 6

Numbers that are divisible by 2 but not by 3 = {2,4,8,10,14, 16,.....}
={ aa, aaaa, aaaaaaaa,.....}



9. Consider a computer system with the 16MB main memory and 64KB cache and the block size is 256B. The 4-way set associative cache maps the following physical addresses in hexadecimal are

A_1: () 1000 Set Index

A_2: () 10 1000 Set Index

A_3: () 1000 Set Index

A_4: () 10 1000 Set Index

A. A1 and A3 are mapping to the same set [ANS]

B. A1 and A4 are mapping to the same set

C. A2 and A3 are mapping to the same set

D. A2 and A4 are not mapping to the same set.

10. For the preemptive O.S, which of the following transition is not correct?

A. Read state to Running state

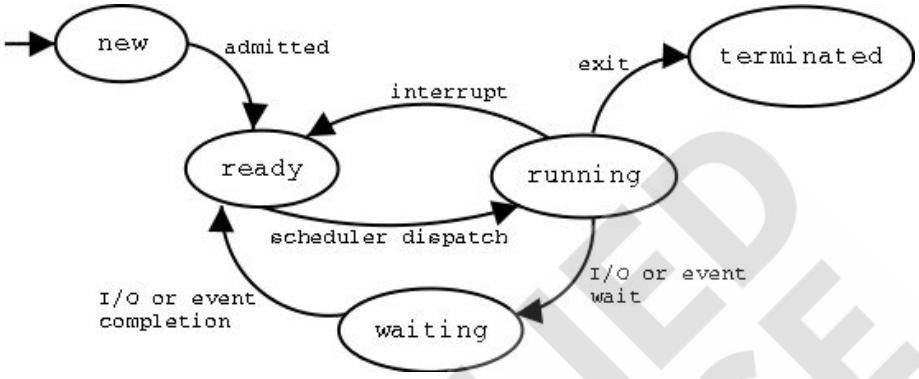
B. Running state to Ready state

C. Blocked state to Ready state

D. Blocked state to Running state

Answer: D

Explanation:



From the process state diagram, we can see that there can't be a transition from waiting/blocked state to the running state. The other options are correct.

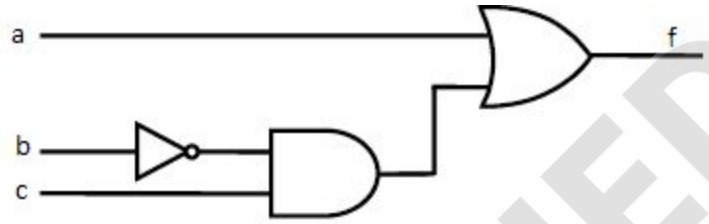
11. If there is no large enough hole to address the need of a new process, if memory is allocated in the given holes, then a new smaller holes will be created. Which of the following options is correct ?
    A. The size of hole created using Next Fit will never be greater than that created by Best Fit
    B. The size of hole created using Best Fit will always be greater than that created by First Fit
    C. The size of hole created by Worst Fit will never be greater than that created by First Fit
    D. The size of hole created by First Fit will always be greater than that created by Next Fit

12. Consider W is a predicate statement where x does not occur bounded. Which of the following predicate logic statements is not valid?
    A. $\exists x(P(x) \wedge W) \equiv \exists xP(x) \wedge W$
    B. $\forall x(P(x) \vee W) \equiv \forall xP(x) \vee W$

C. $\forall x(P(x) \rightarrow W) \equiv \forall x\, P(x) \rightarrow W$

D. $\exists x(P(x) \rightarrow W) \equiv \forall x\, P(x) \rightarrow W$

13. For the given function f (shown in the figure below), which of the minterms represent the function f?



A. Σ(1,4,5,6,7)

B. Σ(1,2,3,6,7)

C. Σ(4,5,6,7)

D. Σ(1,3,5,6,7)

14. Given a group G of 35 elements, the largest subgroup of G other than G itself is ____ [Mark 1]

Answer: 7

Explanation :

Order of a Subgroup always divides the order of Group. The Subgroup of Group having order 35 would have order 1,5,7,35.

So, the largest subgroup of G other than G itself would be 7.

15. Given 1KB memory, which is byte addressable, if a decoder is used to uniquely address this memory and the decoder uses X input lines and Y output lines, the minimum value of X + Y is _____

Answer: 1034

16. Suppose a system is designed where 32 registers are given and 1 Accumulator is given. The designer uses a Multiplexer to uniquely map 32

registers to 1 Accumulator. The number of select lines that will is required for this mapping is _____

Answer: 5

Explanation:

It's a 32 x 1 MUX with 32 input lines.

Thus, $32 = 2^5$ input lines.

2^n inputs require n select lines, therefore, 5 select lines are required.

17. Given two semaphores a and b, where a is initialised to 1 and b is initialised to 0. And count is a global variable that is initialised to 0.
Suppose n processes execute the following code concurrently

```
----------------------
----------------------
---- Section P ----
----------------------
----------------------
wait(a)
count = count + 1
if(count == n)
        signal(b)
signal(a)
wait(b)
signal(b)
----------------------
----------------------
----- Section Q ---
----------------------
----------------------
```

Which of the following options is correct?

A. The above code guarantees that Mutual Exclusion will be preserved among the processes while they are executing in Section P
B. At any instant only 2 processes can execute Section Q
C. n-1 processes will be blocked and 1 process can execute Section Q
D. n processes can execute Section Q at any instant

Answer : C

Explanation:

A. Incorrect because there is no synchronization mechanism given to ensure Mutual Exclusion in Section P.
B. Incorrect because only one process can pass through wait(b).
C. Correct. As when the nth process executes wait(a), increases count by 1 and makes count = n, then signal(b) makes b = 1. Then wait(b) will unblock the first blocked process, thus the remaining (n-1) processes remain blocked.
D. As explained in Option C, this option is incorrect.

18. Which of the following increases in [0,1]

I. e^{-x}
II. $x^2 - sinx$
III. $\sqrt{x^3 + 1}$

A. II only
B. III only
C. I and III only
D. II and III only

Solution B

In order to determine the functions which are increasing in a given interval we can check for their slope/derivative of the curve is positive.

I. If $f(x)=e^{-x}$, $f'(x)=-e^{-x}$ it is -ve in the interval [0,1]

II. If $f(x)=x^2-sinx$, $f'(x)=2x-cosx$ in the interval [0,1] 2x-cosx is -ve at x=0 therefore the it is not increasing at x=0.

III. If $f(x)=\sqrt{x^3+1}$ $f'(x)=\frac{1}{3(x^3+1)^{\frac{2}{3}}}*(3x^2)$. Here for all points in [0,1] here the function is >=0 for all points therefore only III is the increasing function.

19. Many-One relationships of a weak entity set in an E-R diagram is represented by

A. Oval shape with double/bold borders

B. Diamond shape with double/bold borders

C. Rectangular shape with double bold/borders

D. Oval shape with identifier underlined.

20. The output of the following code is _____

```
int main()
{
    int a[4][5]={{1,2,3,4,5},
                 {6,7,8,9,10},
                 {11,12,13,14,15},
                 {16,17,18,19,20}};
                 printf("\n%d",*(*(a+**a+2)+3));
}
```

Answer 19.

https://onlinegdb.com/rJd_IP2fL

21. Consider a relation table R in 3Nf but not in BCNF, which of the following is true?

A. R has a non trivial Functional Dependency of the form X→A where X is not a superkey and A is a non prime attribute and X is not a proper subset of any key.

B. R has a non trivial Functional Dependency of the form X→A where X is not a superkey and A is a non prime attribute and X is a proper subset of any key.

C. R has a non trivial Functional Dependency of the form X→A where X is not a superkey and A is a prime attribute and X is not a proper subset of any key.

D. A cell in R holds a set intersect of the above values.

22. Consider the following schedule with 2 transactions

T1	RA			RC		WD		WB	Commit	
T2		RB	WB		RD		WC			Commit

Which of the following are conflict equivalent to the above schedule .

A.

T1					RA	RC	WB	WD	Commit	
T2	RA	WB	RD	WC						Commit

B.

T1					RA	RC	WB	WD	Commit	
T2	RA	WB	RD	WC						Commit

[ANS]

C.

T1	RA	RC	WD	WB					Commit	
T2					RB	WB	RD	WC		Commit

23.
```
int tob(int b, int *arr)
{
    int i;
    for(i=0;b>0;i++)
    {
        if(b%2)  arr[i]=1;
        else arr[i]=0;
        b=b/2;
    }
    return (i);
```

```
}

int pp(int a, int b)
{
    int i,tot=1.len,ex=a;
    len=tob(b,arr);
    for(i=0;i<len;i++)
    {
        if(arr[i]==1)
        {
            tot=tot*ex;
        }
        ex=ex*ex;
    }
    return (tot);
}
```

What is the value returned by pp(3,4)_____?

Answer: 81.

https://onlinegdb.com/HJQnCK2GI

24.

```
int fun1(int n)
{
    static int i=0;
    if(n>0)
    {
        ++i;
        fun1(n-1);
```

```
        }
        return i;
}

int fun2(int n)
{
static int i=0;
        if(n>0)
        {
                i=i+fun1(n);
                fun2(n-1);
        }
        return i;
}
```

What would be the value returned by fun2(5)___

Answer: 55

https://onlinegdb.com/B1Cwqv2M8

25. Given that a and x are two vectors and a is a non zero vector a$\epsilon\{0,1\}^n$, and b is a vector chosen uniformly randomly form $\{0,1\}^n$ then what is the probability that $\sum_{1}^{n} a_i x_i$ is odd is _____.

26. The number of permutations of the word "LILAC" such that none of the characters are in its actual position given that the repeated characters are indistinguishable is ____.

Answer: 27

The no of Derangements of 5 characters is given by 5![1-1+12!-13!+14!-15!]=54, as we have 2 repeaths 'L' the total no unique de-arrangements are 54/2=27.

27. Consider an undirected graph G(V, E) such that V={V_1,V_2,V_3,V_4...V_{100}} E(i,j) is defined as E(i,j)=|i-j|, what is the weight of the MST of the graph.

Answer: 99

Let us consider the a small graph with 3 edges then its minimal spanning tree is given as 2*(1)=2.
Each edge is connecting the vertices (i,i+1) for this the edges are of weight 1. The number of edges of the MST are |V|-1, in case of the given question |V|=100, now the cost for this is |V|-1=99.
Cost of the MST=99*1=99.

28. Given that A and B are two n×n matrices consider the following statements

I. Rank(AB)=Rank(A)*Rank(B)
II. Determinant(AB)=Determinant(A)*Determinant(B)
III. Rank(A+B)≤Rank(A)+Rank(B)
IV. Determinant(A+B)=Determinant(A)+Determinant(B)

Which of the above are true?

A. I & II
B. III & IV
C. **II & III [ANS]**
D. I & IV

Solution C.

I. Consider any two matrices 3*3 matrices which are nonsingular then the rank of such matrices are 3 for both of them and the rank of AB is also 3 as the product is also non singular rank(AB)=3. Options A and C can be eliminated.

II. We know that from the properties of the determinant

|AB|=|A||B|

From this we can conclude that option C is correct.

29. T(n)=T(n^(1/a))+1, T(b)=1 given a and b are ω(1)

A. $\Theta(log_b log_a n)$

B. $\Theta(log_a log_b n)$ **[ANS]**

C. $\Theta(log_2 log_2 n)$

D. None of the above.

Solution B

This can be solved by using the method of substitution.

$T(n) = T(n^{\frac{1}{a}}) + 1$

$= T(n^{\frac{1}{a}}) + 1$

$= T(n^{\frac{1}{a^2}}) + 2$

$= T(n^{\frac{1}{a^3}}) + 3$

..

$= T(n^{\frac{1}{a^k}}) + k$ (k times we have repeated each time it is doing a constant amount of work).

This will repeat until $n^{\frac{1}{a^k}}$ =b

$n^{\frac{1}{a^k}} = b$

On taking log base b on both the sides

$\frac{1}{a^k} log_b n = 1$

$log_b n = a^k$

On taking log base a on both the sides

$log_a log_b n = k$

Therefore the time complexity is O($log_a log_b n$).

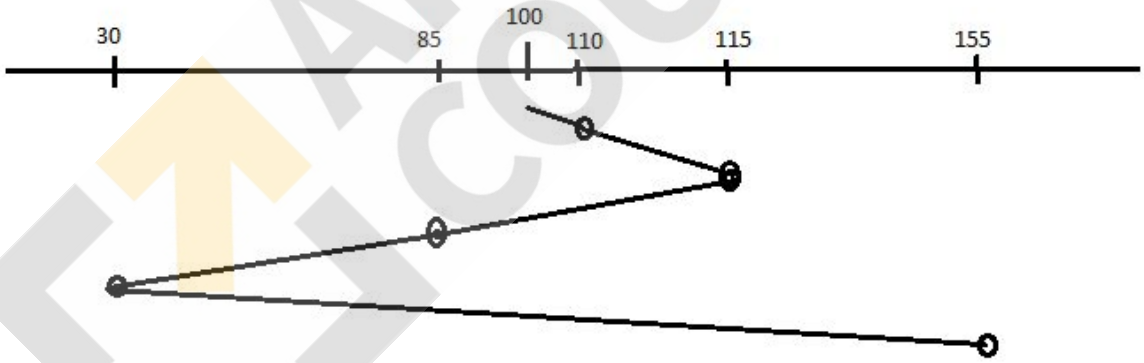
30. Using Shortest Seek Time First (SSTF) disk scheduling algorithm, if the current position of the read-write head is track number 100, for the following sequence of track requests:

30 85 110 115 155
Which of the following options is false?

A. **Request 115 will be serviced only after servicing 85**
B. The read write head will change direction at 30 to service 155
C. Request 115 will be serviced after 110
D. Request 155 will be serviced after 115

Answer: A

Explanation:
Shortest Seek Time First : This algorithm services that request next which requires the least number of head movements from its current position regardless of the direction.



31. For the following 4 processes that arrive at 0,

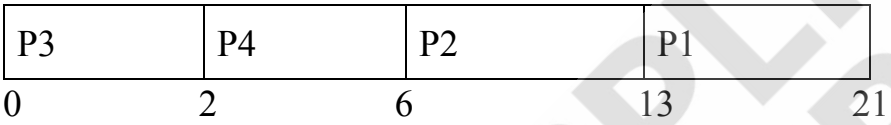
P1	8
P2	7
P3	2

P4	4

What is the absolute difference in Average TAT if these processes are scheduled using SJF and Round Robin Scheduler?
Note : The time quantum of Round Robin scheduling algorithm is = 4 units

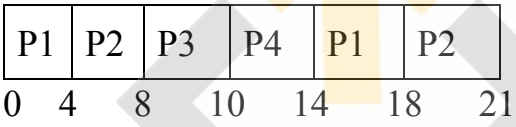
Answer: 5.25 units

Explanation:
SJF



Avg TAT = 42 / 4 = 10.5

RR(TQ = 4)



Average TAT = (18 + 21 + 10 + 14)/4 = 15.75

Absolute difference = 15.75 - 10.5 = 5.25 units

32. Given that TLB Access Time = 20 ns, main memory access time = 100 ns. The hit ratio of TLB = 95%. Page fault ratio = 10% and 20% of the page fault are dirty pages. The time taken to transfer data to and from the memory and disk is 5000 ns. What is the effective memory access time? Consider that the time to update TLB is negligible.

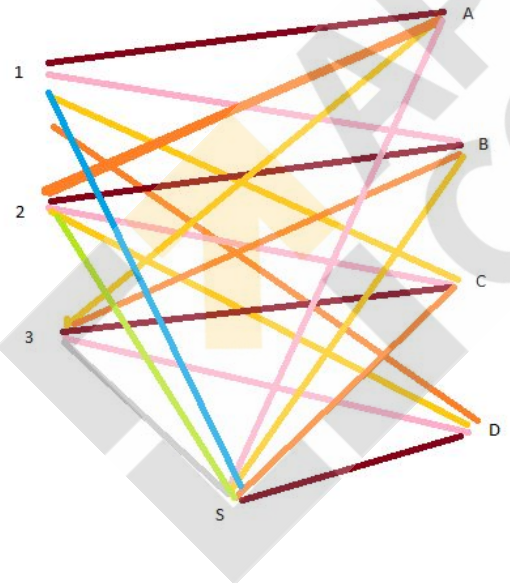
Answer: 125.5 ns

33. Consider the graph $K_{3,4}$. If a vertex S is added to the graph such that S is adjacent to all the vertice of the graph, then what is the minimum number of color required for edge-coloring the graph?

Answer: 7

Explanation :

Edge coloring is a problem in graph theory where all the edges in a given graph must be assigned a color. Furthermore, all edges that are adjacent to each other must be given different colors. In other words, all the edges incident to any specific vertex must contain no repeated colors.



Therefore, 4 colors(for the K3,4) + 3 new colors from vertex S to vertices 1, 2 and 3.

34. Given 1KB memory, which is byte addressable, if a decoder is used to uniquely address this memory and the decoder uses X input lines and Y output lines, the minimum value of X + Y is _____

Answer: 1034

35. Let R be a binary relation on set {1, 2, 3}. If a relation is chosen randomly from R, the probability of chosen relation to be reflexive is ____

Answer: 0.125

The total number relations possible are 2^{n^2}.

The number of relations which are reflexive are 2^{n^2-n}

If the relation is selected randomly then then probability that it is reflexive is

$= \frac{2^{(n^2-n)}}{2^{n^2}} = \frac{1}{2^n} = \frac{1}{8} = 0.125.$

36. If the given preorder of the binary search tree is 15,10,12,11,20, 18, 16, 19. Find the post-order traversal?

Answer: Post order: 11,12,10,16,19,18,20,15

37. Binary min-heap has 1023 elements. Find the number of comparisons required to find the max element?

Answer: 511

Max element can only be found in Leaf nodes, as per the question number of leaf nodes are 512. To get the maximum value of these leaf nodes we need 511 nodes.

38. Find the worst-case time complexity of inserting n elements in the empty linked list in the sorted order?

A. **o(nlogn)**
B. o(n^2)
C. o(1)
D. o(n)

Solution:

Given that it's an empty linked list, we have to insert the n elements in sorted order. We can sort the given n elements in O(nlogn) and then insert them in to the list which is O(n)

⇒ O(nlog n)+O(n) = O(n logn)

39. There are n elements in the balanced binary search tree. What is the time complexity to report the k elements in the range [a,b]?

A. logn
B. nlogk
C. klogn
D. logn +k

Solution:
We need first find the indices of a & b, which takes time of log n+log n(since its given balanced binary search tree). Once we find the indices, we can directly print the k elements(As K can be significant)
⇒ **logn + k**

40. In the AVL tree n elements are there, what is the time complexity of inserting other n^2 elements?

A. n^2 logn
B. n^3
C. n^4
D.

Solution:
Insertion in to the AVL tree takes a time of logn
Therefore 1st insertion takes logn,
2nd insertion takes log(n+1),
3rd insertion takes log(n+2),
.
.
n^2 insertions takes log(n+n^2)

Total time can be logn + log(n+1) + log(n+2) +...+ log(n+n^2)
⇒ log(n*(n+1)*(n+2).....*(n+n^2))
⇒ We can assume the upper bound function O(log(n)^n^2)
⇒ n^2 * log n

41. Double hashing
h1(K) = K mod 23 , h2(K) = 1 + Kmod19. The value of the key=90. If the probe is starting from 0,
Then find the value of hash function at K=90 when a probe is 1?

42. Which of the following statements is True?
I. A router can not change the value of an IP packet.
II. A router doesn't necessarily implement routing algorithms.
III. The reassembly is done at the router when the next MTU is bigger than the previous MTU.
Answer: Statement II is True.

43. In the TCP congestion avoidance algorithm MSS = 2 KB, The Round trip time = 6 ms. The initial threshold is 32 KB. We are starting from t=0. What will be the size of the congestion window after t+60?
Answer: 44

Explanation:

First transmission: 2 KB → 6ms
Second transmission: 4 KB → 6ms
Third transmission: 8 KB→ 6ms
Fourth transmission: 16 KB→ 6ms
Fifth transmission: 32 KB [Th reached] → 6ms
Sixth transmission: 34 KB→ 6ms
Seventh transmission: 36 KB→ 6ms
Eighth transmission: 38 KB→ 6ms
Ninth transmission: 40 KB→ 6ms
Tenth transmission: 42 KB→ 6ms

After completion of 6 x10 = 60 ms
For the eleventh transmission, the congestion window size is 44 KB

44. The ISP is providing 202.61.0.0/17 to the organization using CIDR methodology. An organization needs 1500 addresses. The ISP wants to minimize its routing entries using the route aggregation.
    I. 202.61.84.0/21
    II. 202.61.104.0/21
    III. 202.61.64.0/21
    IV. 202.61.144.0/21

45. A web browser is connected to the server using a non-persistent http connection. A web page consists of text and 5 images then how many TCP connections are required? **Ans 6**

Solution:

Text + 5 images = 6 objects.
In the non-persistent HTTP connection for every object separate TCP connection is established.

Like that we have 6 objects, six TCP connections required.

46. Consider a non-pipelined processor with speed of 2.5Ghz and 5 Clock cycles. Due to pipeline the speed of CPU reduced to 2 Ghz. 30% are the memory reference instructions and 60% are ALU instructions and the remaining are Branch related instructions. 5%of the memory reference instructions will cause a stall of 59 clock cycles and No stalls for ALU operations and 50% of the branch instructions cause 2 stall cycles. The speedup of the pipelined processor is with the non-pipelined processor is_____

Answer:2.24
Time for the non-pipelined processor = 5*(1/(2.5)) ns = 2ns

Time for the pipelined processor is =1.785*(½) ns = 0.8925ns
Pipelined processor speed = 2GHZ
= 0.3(0.95*1 + 0.05*50) + 0.6 (1) + 0.1(0.5 + 0.5*2)
= 0.3(0.95+2.5)+0.6+ 0.1(1.5)
= 1.035 +0.6+ 0.15 = 1.785
Speedup = 2/ 0.8925 = 2.24

47. Consider a cache with access time of 3ns and the block size is 256B. The hit ratio is 94% and for the miss in cache first word will take 20 ns and the remaining words in the block will take 5ns. Word length is 64bits. Then the average memory access time is_____

Answer:13.32

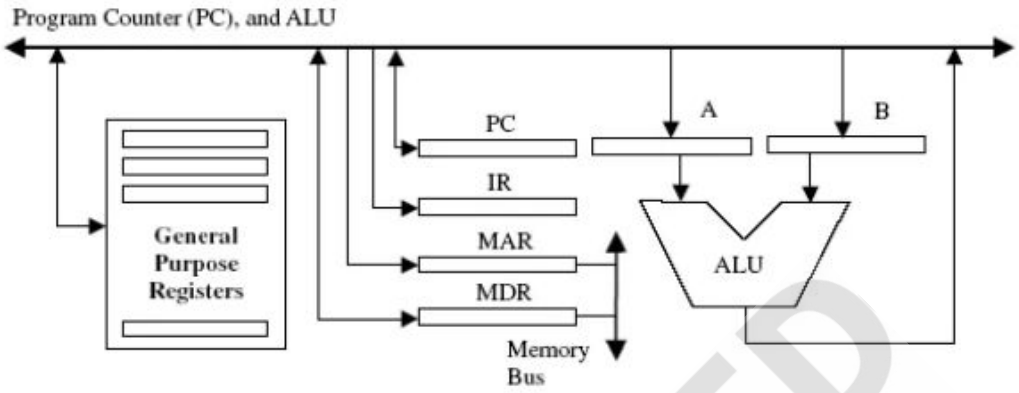
Explanation:

Given that Hit ratio = 94%
Word length = 64bits =8B
Block size = 256B
Number of words in the cache block = 256B/8B = 32
For a cache miss we need to transfer block into cache and for the transfer of the first word 20ns and the remaining 31 words will take 5ns each.
AMAT = 0.94*3 + 0.06(1*20ns + 31*5ns) = 2.88 + 0.06(175) = 2.88 + 10.5 = 13.32

48. Consider a system consisting of 64 registers and teo types of instructions R-type and I-type. The word length is 16bits. The R-type instructions are having the opcode and two register names and the I-type instructions are 4-bit immediate address and one register name along with the opcode. If the I-type instructions are 8 then the possible R-type instructions are_____

Answer: 8

49. Consider the following ALU data path (Similar to the GATE)



One-bus datapath

In the given diagram B is the temp1 register and output of the ALU is temp2
For the instruction R0← R1+R2
The order of the following micro operations are

A. 1, 2,4, 1, 5
B. 2, 3, 5, 1, 4
C. 5,3 ,2, 1, 4
D. 5, 3, 1, 2, 4

50. Consider the following table

Catalogue		
Sno	Pno	Cost
S1	1	150
S1	2	50
S1	3	100
S2	4	200
S2	5	250
S3	1	250
S3	2	250

S3	5	300
S3	4	250

Supplier		
Sno	Sname	loc
S1	M/S Royal Furnitures	Delhi
S2	M/S Balaji Furnitures	Bangalore
S3	M/S Premier Furnitures	Chennai

Parts		
Pno	Pname	part_spec
1	Table	Wood
2	Chair	Wood
3	Table	Steel
4	Almirah	Steel
5	Almirah	Wood

What is the number of rows in the result of the following query?

```
SELECT Sno, Sname
FROM Suppliers S, Catalogue C
WHERE S.Sno==C.Sno AND cost >(SELECT avg(cost) WHERE
Pno='p4' GROUP BY Pno)
```

A. 0

B. 4

C. 5

D. 2

51. Let G(V, E) represent an undirected graph where its minimal spanning tree T is represented by using the adjacency list representation, if another edge is added to T, which of the following represents the time complexity to check if the resulting graph is an MST. [Marks 2]

A. Θ(|V|)
B. Θ(|E||V|)
C. Θ(|E|+|V|)
D. Θ(|E|log|V|)

52.