Computer Science Engineering

Q. No. 1 – 25 Carry One Mark Each

1. Let X be a Gaussian random variable mean 0 and variance σ^2. Let Y=max(X, 0) where max (a,b) is the maximum of a and b. The median of Y is _____.

2. The statement $(\neg p) \Rightarrow (\neg q)$ is logically equivalent to which of the statements below?

    I. $p \Rightarrow q$
    II. $q \Rightarrow p$
    III. $(\neg q) \vee p$
    IV. $(\neg p) \vee q$

    (A) I only   (B) I and IV only   (C) II only   (D) II and III only

3. Consider the following table:

Algorithms		Design Paradigms	
P.	Kruskal	i.	Divide and Conquer
Q.	Quicksort	ii.	Greedy
R.	Floyd-Warshall	iii.	Dynamic Programming

    Match the algorithms to the design paradigms they are based on.

    (A) P-(ii), Q-(iii),R-(i)   (B) P-(iii), Q-(i), R-(ii)
    (C) P-(ii), Q-(i), R-(iii)   (D) P-(i), Q-(ii), R-(iii)

4. Consider the Karnaugh map given below, where x represents "don't care" and blank represents 0.

    Assume for all inputs (a, b, c, d) the respective complements $\left(\bar{a}, \bar{b}, \bar{c}, \bar{d} \right)$ are also available. The above logic is implemented 2-input NOR gates only. The minimum number of gates required is _____.

5. A sender S sends a message m to receiver R, which is digitally signed by S with its private key. In this scenario, one or more of the following security violations can take place.

    I. S can launch a birthday attack to replace m with a fraudulent message.

    II. A third party attacker can launch a birthday attack to replace m with a fraudulent message.

III. R can launch a birthday attack to replace m with a fraudulent message.

Which of the following are possible security violations?

(A) I and II only   (B) I only   (C) II only   (D) II and III only

6. Consider a two-level cache hierarchy with L1 and L2 caches. An application incurs 1.4 memory accesses per instruction on average. For this application, the miss rate of L1 cache 0.1, the L2 cache experiences, on average, 7 misses per 1000 instructions. The miss rate of L2 expressed correct to two decimal places is _____.

7. Consider the following CPU processes with arrival times (in milliseconds) and length of CPU burst (in milliseconds) as given below:

Process	Arrival time	Burst time
P1	0	7
P2	3	3
P3	5	5
P4	6	2

If the pre-emptive shortest remaining time first scheduling algorithm is used to schedule the processes., then the average waiting time across all processes is _____ milliseconds.

8. Threads of a process share

(A) global variable but not heap.

(B) heap but not global variables.

(C) neither global variables nor heap.

(D) Both heap and global variables.

9. Let $c_1........c_n$ be scalars, not all zero, such that $\sum_{i=1}^{n} c_i a_i = 0$ where a_i are column vectors in R^n. Consider the set of linear equations $Ax = b$

where $A = [a_1.......a_n]$ and $b = \sum_{i=1}^{n} a_i$. The set of equations has

(A) a unique solution at $x = J_n$ where J_n denotes a n-dimensional vector of all 1

(B) no solution

(C) infinitely many solutions

(D) finitely many solutions

10. Consider the following grammar.

$$P \rightarrow xQRS$$
$$Q \rightarrow yz|z$$
$$R \rightarrow w|\in$$
$$S \rightarrow y$$

What is FOLLOW (Q) ?

(A) {R}   (B) {w}   (C) {w, y}   (D) {w, $}

11. Consider the language L given by the regular expression $(a + b)^* b(a+b)$ over the alphabet {a, b}. The smallest number of states needed in a deterministic finite-state automation (DFA) accepting L is _____.

12. The n-bit fixed-point representation of an unsigned real number real X uses f bits for the fraction part. Let i = n –f. The range of decimal values for X in this representation is

    (A) 2^{-f} to 2^i
    (B) 2^{-f} to $\left(2^i - 2^{-f}\right)$
    (C) 0 to 2^i
    (D) 0 to $\left(2^i - 2^{-f}\right)$

13. Consider the following intermediate program in three address code

    $p = a - b$
    $q = p * c$
    $p = u * v$
    $q = p + q$

    Which one of the following corresponds to *a static single assignment* form of the above code ?

    (A) $p_1 = a - b$
    $\quad q_1 = p_1 * c$
    $\quad p_1 = u * v$
    $\quad q_1 = p_1 + q_1$

    (B) $p_3 = a - b$
    $\quad q_4 = p_3 * c$
    $\quad p_4 = u * v$
    $\quad q_5 = p_4 + q_4$

    (C) $p_1 = a - b$
    $\quad q_1 = p_2 * c$
    $\quad p_3 = u * v$
    $\quad q_2 = p_4 + q_3$

    (D) $p_1 = a - b$
    $\quad q_1 = p * c$
    $\quad p_2 = u * v$
    $\quad q_2 = p + q$

14. Consider the C code fragment given below.

    ```
    typedef struct node   {
        int data;
        node* next ;
    } node;
    void join (node* m, node* n)   {
    node* p=n ;
    while (p->next ! =NULL){
    p = p –> next ;
    }
    p–> next = m;
    }
    ```

    Assuming that m and n point to valid NULL- terminated linked lists, invocation of join will

    (A) append list m to the end of list n for all inputs.

    (B) either cause a null pointer dereference or append list m to the end of list n.

    (C) cause a null pointer dereference for all inputs.

    (D) append list n to the end of list m for all inputs.

15. Consider a TCP client and a TCP server running on two different machines. After completing data transfer, the TCP client calls **close** to terminate the connectional and a FIN segment is sent to the TCP server. Server-side TCP responds by sending an ACK which is received by the client-side TCP. As per the TCP connections state diagram (RFC 793), in which state does the client-side TCP connection wait for the FIN from the sever-side TCP?

    (A) LAST-ACK   (B) TIME-WAIT   (C) FIN-WAIT-1   (D) FIN-WAIT-2

16. Consider the following context-free grammar over the alphabet $\Sigma = \{a, b, c\}$ with S as the start symbol.

    $S \rightarrow abScT \mid abcT$

    $T \rightarrow bT \mid b$

    Which one of the following represents the language generated by the above grammar ?

    (A) $\left\{ (ab)^n (cb)^n \mid n \geq 1 \right\}$

    (B) $\left\{ (ab)^n cb^{m_1} cb^{m_2} ... cb^{m_n} \mid n, m_1, m_2, ... m_n \geq 1 \right\}$

    (C) $\left\{ (ab)^n \left(cb^m\right)^n \mid m, n \geq 1 \right\}$

    (D) $\left\{ (ab)^n \left(cb^n\right)^m \mid m, n \geq 1 \right\}$

17. Consider the first-order logic sentence $F : \forall z \left(\exists y R(x, y)\right)$. Assuming non-empty logical domains, which of the sentences below are *implied* by F?

    I. $\exists y \left(\exists x R(x, y)\right)$ II. $\exists y \left(\forall x R(x, y)\right)$

    III. $\forall y \left(\exists x R(x, y)\right)$ IV. $\neg \exists x \left(\forall y \neg R(x, y)\right)$

    (A) IV only   (B) I and IV only   (C) II only   (D) II and III only

18. Consider the C struct defined below:

    struct data {

           int marks [100] ;

           char grade;

           int cnumber;

    };

    struct data student;

    The base address of student is available in register R1. The field student.grade can be accessed efficiently using

    (A) Post-increment addressing mode. (R1)+

    (B) Pre-decrement addressing mode, -(R1)

    (C) Register direct addressing mode, R1

    (D) Index addressing mode, X(R1), where X is an offset represented in 2's complement 16-bit representation.

19. Consider a database that has the relation schema EMP (EmpId, EmpName, and DeptName).
An instance of the schema EMP and a SQL query on it are given below.

EMP		
EmpId	**EmpName**	**DeptName**
1.	XYA	AA
2.	XYB	AA
3.	XYC	AA
4.	XYD	AA
5.	XYE	AB
6.	XYF	AB
7.	XYG	AB
8.	XYH	AC
9.	XYI	AC
10	XYJ	AC
11.	XYK	AD
12.	XYL	AD
13.	XYM	AE

```
SELECT  AVG(EC.Num)
FROM  EC
WHERE(DeptName, Num)IN
        (SELECT DeptName, COUNT(EmpId)AS
                EC(DeptName, Num)
    FROM EMP
    GROUP BY DeptName)
```

The output of executing the SQL query is _____.

20. When two 8-bit numbers $A_7....A_0$ and $B_7.....B_0$ in 2's complement representation (with A_0 and B_0 as the least significant bits) are added using a **ripple-carry adder**, the sum bits obtained are $S_7....S_0$ and the carry bits are $C_7....C_0$. An overflow is said to have occurred if

(A) the carry bit C_7 is 1   (B) all the carry bits $(C_7....C_0)$ are 1

(C) $(A_7 B_7.\overline{S_7} + \overline{A_7}.\overline{B_7}.S_7)$ is 1   (D) $(A_0.B_0.\overline{S_0} + \overline{A_0}.\overline{B_0}.S_0)$ is 1

21. The following functional dependencies hold true for the relational schema R{V,W,X,Y,Z}:

$V \rightarrow W$

$VW \rightarrow X$

$Y \rightarrow VX$

$Y \rightarrow Z$

Which of the following is irreducible equivalent for this set of functional dependencies ?

(A) $V \rightarrow W$	(B) $V \rightarrow W$	(C) $V \rightarrow W$	(D) $V \rightarrow W$
$V \rightarrow X$	$W \rightarrow X$	$V \rightarrow X$	$W \rightarrow X$
$Y \rightarrow V$	$Y \rightarrow V$	$Y \rightarrow V$	$Y \rightarrow V$
$Y \rightarrow Z$	$Y \rightarrow Z$	$Y \rightarrow X$	$Y \rightarrow X$
		$Y \rightarrow Z$	$Y \rightarrow Z$

22. Consider the following functions from positive integers to real numbers:

$$10, \sqrt{n}, n, \log_2 n, \frac{100}{n}$$

The CORRECT arrangement of the above functions in increasing order of asymptotic complexity is:

(A) $\log_2 n, \dfrac{100}{n}, 10, \sqrt{n}, n$

(B) $\dfrac{100}{n}, 10, \log_2 n, \sqrt{n}, n$

(C) $10, \dfrac{100}{n}, \sqrt{n}, \log_2 n, n$

(D) $\dfrac{100}{n}, \log_2 n, 10, \sqrt{n}, n$

23. Let T be a tree with 10 vertices. The sum of the degrees of all the vertices in T is _____.

24. Let T be a binary search tree with 15 nodes. The minimum and maximum possible heights of T are :

Note: *The height of a tree with a single node is 0.*

(A) 4 and 15 respectively

(B) 3 and 14 respectively

(C) 4 and 14 respectively

(D) 3 and 15 respectively

25. Consider the following C code:
```
# include <stdio.h>
int * assignval (int *x, int val)  {
    *x = val;
    return x;
}
void main ( )  {
    int  * x= malloc (sizeof (int));
    if (NULL = = x) return;
    x = assignval (x,0);
    if(x)   {
    x=(int *) malloc (sizeof (int));
    if (NULL = = x) return;
    x = assignval (x, 10);
}
printf("%d\n",  *x);
free (x);
}
```

The code suffers from which one of the following problems:

(A) compiler error as the return of malloc is not typecast appropriately.

(B) compiler error because the comparison should be made as x==NULL and not as shown.

(C) compiles successfully but execution may result in dangling pointer.

(D) compiles successfully but execution may result in memory leak.

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26. The number of integers between 1 and 500 (both inclusive) that are divisible by 3 or 5 or 7 is _____.

27. Consider a combination of T and D flip-flops connected as shown below. The output of the D flip-flop is connected to the input of the T flip-flop and the output of the T Flip-flop is connected to the input of the D Flip-flop.
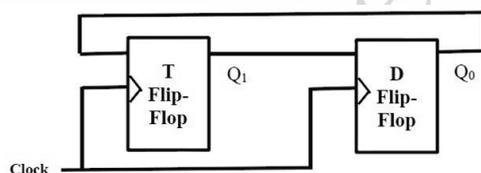
Initially, both Q_0 and Q_1 are set to 1 (before the 1st clock cycle). The outputs

(A) Q_1Q_0 after the 3rd cycle are 11 and after the 4th cycle are 00 respectively

(B) Q_1Q_0 after the 3rd cycle are 11 and after the 4th cycle are 01 respectively

(C) Q_1Q_0 after the 3rd cycle are 00 and after the 4th cycle are 11 respectively

(D) Q_1Q_0 after the 3rd cycle are 01 and after the 4th cycle are 01 respectively

28. Consider a RISC machine where each instruction is exactly 4 bytes long. Conditional and unconditional branch instructions use PC- relative addressing mode with Offset specified in bytes to the target location of the branch instruction. Further the Offset is always with respect to the address of the next instruction in the program sequence. Consider the following instruction sequence.

Instr. No.	Instruction
i:	add R2, R3, R4
i +1:	sub R5, R6, R7
i + 2:	cmp R1, R9, R10
i + 3	beq R1, Offset

If the target of the branch instruction is i, then the decimal value of the Offset is _____.

29. Consider the C functions foo and bar given below:

```
int foo (int val ) {
    int x = 0;
    while (val > 0)  {
    x = x + foo ( val --);
}
    return val ;
}
int bar (int val )  {
int x = 0;
while (val > 0) {
    x = x + bar (val – 1) ;
    }
return val ;
}
```

Invocations of foo (3) and bar (3) will result in:

(A) Return of 6 and 6 respectively.

(B) Infinite loop and abnormal termination respectively.

(C) Abnormal termination and infinite loop respectively.

(D) Both terminating abnormally

30. If G is grammar with productions

$S \rightarrow SaS|aSb|bSa|SS|\in$

where S is the start variable, then which one of the following is not generated by G?

(A) abab   (B) aaab   (C) abbaa   (D) babba

31. The value of $\lim\limits_{x \to 1} \dfrac{x^7 - 2x^5 + 1}{x^3 - 3x^2 + 2}$

(A) is 0   (B) is -1   (C) is 1   (D) does not exist

32. In a RSA cryptosystem a participant A uses two prime numbers p = 13 and q =17 to generate her public and private keys. If the public key of A is 35. Then the private key of A is _____.

33. Let A be an array of 31 numbers consisting of sequence of 0's followed by a sequence of 1's. The problem is to find the smallest index *i* that A[*i*] is 1 by probing the minimum numbers of locations in A. The *worst case* number of probes performed by an *optimal* algorithm is _____.

34. Instructions execution in a processor is divided into 5 stages. Instruction Fetch (IF), Instruction Decode (ID) , Operand Fetch (OF), Execute (EX), and Write Back (WB), These stages take **5,4,20, 10 and 3 nanoseconds (ns)** respectively. A pipelined implementation of the processor requires buffering between each pair of consecutive stages with a delay of 2ns. Two pipelined implementations of the processor are contemplated.

    (i) a naïve pipeline implementation (NP) with 5 stages and

    (ii) an efficient pipeline (EP) where the OF stage id divided into stages OF1 and OF2 with execution times of 12 ns and 8 ns respectively.

    The speedup (correct to two decimals places) achieved by EP over NP in executing 20

    independent instructions with no hazards is _____.

35. Consider a database that has the relation schemas EMP(EmpId, EmpName, DepId). And DEPT(DeptName, DeptId). Note that the DeptId can be permitted to be NULL in the relation EMP. Consider the following queries on the database expressed in tuple relational calculus.

    (I) $\{t|\exists u \in EMP(t[EmpName] = u[EmpName] \land \forall v \in DEPT(t[DeptId] \neq v[DeptId]))\}$

    (II) $\{t|\exists u \in EMP(t[EmpName] = u[EmpName] \land \exists v \in DEPT(t[DeptId] \neq v[DeptId]))\}$

    (III) $\{t|\exists u \in EMP(t[EmpName] = u[EmpName] \land \exists v \in DEPT(t[DeptId] \neq v[DeptId]))\}$

    Which of the above queries are safe?

    (A) (I) and (II) only   (B) (I) and (III) only

    (C) (II) and (III) only   (D) (I), (II) and (III)

36. Recall that Belady's anomaly is that the pages-fault rate may increase as the number of allocated frames increases. Now consider the following statements:

    S1: *Random page replacement* algorithm (where a page chosen at random is replaced) suffers from Belady's anomaly

    S2: *LRU page replacement* algorithm suffers from Belady's anomaly

    Which of the following is CORRECT ?

    (A) S1 is true, S2 is true   (B) S1 is true, S2 is false

    (C) S1 is false , S2 is true   (D) S1 is false, S2 is false

37. The output of executing the following C program is _____.

```
# include <stdio.h>
int  total (int v) {
while (v)   {
     count + = v & 1;
     v>> = 1;
}
     return count;
}
void main ( ) {
static int x = 0;
int  i = 5;
for (; i> 0; i--)  {
```

```
        x=x + total (i) ;
    }
    printf ("%d\n", x)  ;
    }
```

38. Consider the following C program.

```
#include <stdio.h>
#include<string.h>
void printlength (char *s, char *t) {
    unsigned int c = 0;
    int len = ((strlen(s) – strlen (t)) > c) ? strlen(s): strlen(t);
    printf ("%d\n", len);
}
void main (  ) {
    char  *x = "abc";
    char  *y ="defgh";
    printlength (x,y);
```

Recall that strlen is defined in string.h as returning a value of type size_t, which is an unsigned int. The output of the program is _____.

39. Consider a 2-way set associative cache with 256 blocks and uses LRU replacement, Initially the cache is empty. Conflict misses are those misses which occur due the contention of multiple blocks for the same cache set. Compulsory misses occur due to first time access to the block. The following sequence of accesses to memory blocks.

(0,128,256,128,0,128,256,128,1,129,257,129,1,129,257,129)

is repeated 10 times. The number of *conflict misses* experienced by the cache is _____.

40. Consider the following languages over the alphabet $\sum = \{a, b, c\}$

Let $L_1 = \{a^n b^n c^m \mid m, n \geq 0\}$ and $L_2 = \{a^m b^n c^n \mid m, n \geq 0\}$

Which of the following are context-free languages ?

I. $L_1 \cup L_2$ II. $L_1 \cap L_2$

(A) I only   (B) II only   (C) I and II   (D) Neither I nor II

41. Let u and v be two vectors in $\mathbf{R}^2$ whose Euclidean norms satisfy $\|u\| = 2\|v\|$. What is the value of α such that $w = u + \alpha v$ bisects the angle between u and v ?

(A) 2   (B) 1/2   (C) 1   (D) -1/2

42. Consider the following grammar:

$stmt \rightarrow if\ expr\ then\ else\ expr; stmt \mid 0$

$expr \rightarrow term\ relop\ term \mid term$

$term \rightarrow id \mid number$

$if \rightarrow a \mid b \mid c$

$number \rightarrow [0 - 9]$

where **relop** is a relational operate (e.g $<$, $>$,....) ---O refers to the empty statement, and **if** ,**then, else** are terminals.

Consider a program P following the above grammar containing ten **if** terminals. The number of control flows paths in P is _____. For example the program

if e_1 **then** e_2 **else** e_3

has 2 controls flow paths $e_1 \rightarrow e_2$ and $e_1 \rightarrow e_3$

43. Consider   the expression $(a-1)^* \big(((b+c)/3)+d)\big)$. Let X be the minimum number of registers required by an *optimal* code generation (without any register spill) algorithm for a load/store architecture in which *(i) only loads and store instructions can have memory operands and (ii) arithmetic instructions can have only register or immediate operands*. The value of X is _____.

44. Let G = (V, E) be any connected undirected edge-weighted graph. The weights of the edges in E are positive and distinct. Consider the following statements:

(I)   Minimum spanning tree of G is always unique.

(II) Shortest path between any two vertices of G is always unique.

Which of the above statements is/are necessarily true?

(A) (I) only   (B) (II) only

(C) Both (I) and (II)   (D) Neither (I) nor (II)

45. Let A and B be infinite alphabets and let # be a symbol outside both A and B. Let f be a total functional from A^* to B^*. We say f is *computable* if there exists a Turning machine M which given an input x in A^*, always halts with $f(x)$ on its tape. Let L_f denote the language $\{x \# f(x) | x \in A^*\}$ .Which of the following statements is true:

(A) f if computable if and only if L_f is recursive.

(B) f is computable if and only L_f recursively enumerable.

(C) If f is computable then L_f is recursive, but not conversely.

(D) If f is computable then L_f is recursively enumerable, but not conversely.

46. In a database system, unique time stamps are assigned to each transaction using Lamport's logical clock . Let $TS(T_1)$ and $TS(T_2)$ be the timestamps of transactions T_1 and T_2 respectively. Besides, T_1 holds a lock on the resource R, and T_2 has requested a conflicting lock on the same resource R. The following algorithm is used to prevent deadlocks in the database system assuming that a killed transaction is restarted with the same timestamp.

> if $TS(T_2) < TS(T_1)$ then
>
> > T_1 is killed
>
> else T_2 waits.

Assume any transactions that is not killed terminates eventually. Which of the following is TRUE about the database system that uses the above algorithm to prevent deadlocks?

(A) The database system is both deadlock-free and starvation- free.

(B) The database system is deadlock- free, but not starvation-free.

(C) The database system is starvation-free but not deadlock- free.

(D) The database system is neither deadlock- free nor starvation-free.

47. A cache memory unit with capacity of N words and block size of B words is to be designed. If it is designed as a direct mapped cache, the length of the TAG field is 10 bits. If the cache unit is now designed as a 16-way set-associative cache, the length of the TAG field is _____bits.

48. Consider the following two functions.

```
void funl (int  n)   {                     void fun2 (int  n)   {
     if (n = =0 ) return;                        if (n = = 0) return ;
     printf ("%d" , n);                          printf ("%d" , n);
     fun2 (n - 2);                               fun1(++n) ;
     printf ("%d" , n);                          printf ("%d" , n);
}                                          }
```

The output printed when fun1 (5) is called is

(A) 53423122233445   (B) 53423120112233

(C) 53423122132435   (D) 534423120213243

49. A computer network uses polynomials over *GF(2)* for error checking with 8 bits as information bits and uses $x^3 + x + 1$ as the generator polynomial to generate the check bits. In this network, the message 01011011 is transmitted as

(A) 01011011010   (B) 01011011011   (C) 01011011101   (D) 01011011100

50. Let p, q, and r be propositions and the expression $(p \rightarrow q) \rightarrow r$ be a contradiction. Then, the expression $(r \rightarrow p) \rightarrow q$ is

(A) a tautology   (B) a contradiction

(C) always TRUE when p is FALSE   (D) always TRUE when q is TRUE

51. A multithreaded program P executes with x number of threads and uses y number of locks for ensuring mutual exclusion while operating on shared memory locations. All locks in the program are *non-reentrant*, i.e., if a thread holds a lock *l*, then it cannot re-acquire lock *l* without releasing it. If a thread is unable to acquire a lock, it blocks until the lock becomes available. The *minimum* value of x and the *minimum* value of y together for which execution of P can result in a deadlock are:

(A) x = 1, y = 2   (B) x =2, y=1   (C) x = 2,y=2   (D) x = 1, y = 1

52. The values of parameters for the Stop-and – Wait ARQ protocol are as given below:

Bit rate of the transmission channel = 1Mbps

Propagation delay from sender to receiver = 0.75 ms

Time to process a frame = 0.25ms

Number of bytes in the information frame =1980

Number of bytes in the acknowledge frame = 20

Number of overhead bytes in the information frame = 20

Assume that there are no transmission errors. Then the transmission efficiency (expressed in percentage) of the Stop-and – Wait ARQ protocol for the above parameters is _____(correct to 2 decimal places)

53.   Let A be $n \times n$ real valued square symmetric matrix of rank 2 with $\sum_{i=1}^{n}\sum_{j=1}^{n}A_{ij}^{2}=50$. Consider

the following statements.

(I)   One eigen value must be in [-5, 5]

(II) The eigen value with the largest magnitude must be strictly greater than 5.

Which of the above statements about eigen values of A is/are necessarily CORRECT?

(A) Both (I) and (II)   (B) (I) only

(C) (II) only   (D) Neither (I) nor (II)

54.   Consider a database that has the relation schema CR (StudentName, CourseName). An instance of the schema CR is as given below.

CR	
Student Name	**Course Name**
SA	CA
SA	CB
SA	CC
SB	CB
SB	CC
SC	CA
SC	CB
SC	CC
SD	CA
SD	CB
SD	CC
SD	CD
SE	CD
SE	CA
SE	CB
SF	CA
SF	CB
SF	CC

The following query is made on the database.

$T1 \leftarrow \pi_{CourseName}\left(\sigma_{StudentName='SA'}\left(CR\right)\right)$

$T2 \leftarrow CR \div T1$

The number of rows in T2 is _____.

55. Consider the context-free grammars over the alphabet {a,b,c} given below. S and T are non-terminals

$G_1 : S \rightarrow aSb | T, T \rightarrow cT | \in$

$G_2 : S \rightarrow bSa | T, T \rightarrow cT | \in$

The language $L(G_1) \cap L(G_2)$ is

(A) Finite.　　　　　　　　　　　　　　(B) Not finite but regular.

(C) Context-free but not regular.　　　　(D) Recursive but not context-free.

General Aptitude
Q. No. 1 - 10 Carry One Mark Each

1. After Rajendra chola returned from his voyage to Indonesia, he _____ to visit the temple in Thanjavur.

   (A) was wishing　　(B) is wishing　　　　(C) wished　　(D) had wished

2. The probability that a k-digit number does NOT contain the digits 0,5,or 9 is

   (A) 0.3^k　　　　(B) 0.6^k　　　　(C) 0.7^k　　　　(D) 0.9^k

3. Research in the workplace reveals that people work for many reason _____.

   (A) money beside　　(B) beside money　　(C) money besides　　(D) besides money

4. Find the smallest number y such that $y \times 162$ is a perfect cube.

   (A) 24　　　　(B) 27　　　　(C) 32　　　　(D) 36

5. Rahul Murali, Srinivas and Arul are seated around a square table. Rahul is sitting to the left of Murali. Srinivas is sitting to the right of Arul. Which of the following pairs are seated opposite each other ?

   (A) Rahul and Murali　　　　　　　　(B) Srinivas and Arul

   (C) Srinivas and Murali　　　　　　　(D) Srinivas and Rahul

Q. No. 6 – 10 Carry Two Marks Each

6. A contour line joins locations having the same height above the mean sea level. The following is a contour plot of a geographical region. Contour lines are shown at 25m intervals in this plot. If in a flood, the water level rises to 525m, which of villages P,Q, R, S,T get submerged ?
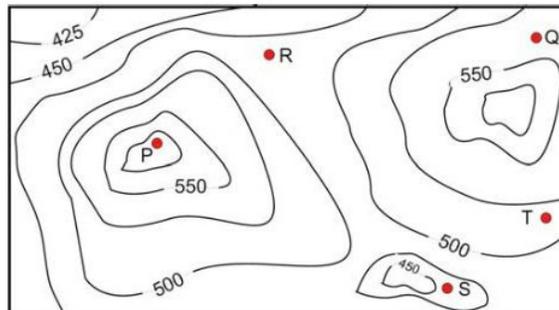
   (A) P,Q　　　　　(B) P,Q,T　　　　　(C) R,S,T　　　　　(D) Q,R,S

7. Six people are seated around a circular table. There are at least two men and two women . There are at least three right-handed persons. Every woman has a left-handed person to her immediate right. None of the women are right-handed. The number of women at the table is

(A) 2

(B) 3

(C) 4

(D) Cannot be determined

8. Arun, Gulab, Neel and Shweta must choose one shirt each from a pile of four shirts coloured red, pink, blue and white respectively. Arun dislikes the colour red and Shweta dislikes the colour white. Gulab and Neel like all the colours. In how many different ways can they choose the shirts so that no one has a shirt with a colour he or she dislikes ?

(A) 21

(B) 18

(C) 16

(D) 14

9. "The hold of the nationalist imagination on our colonial past is such that anything inadequately or improperly nationalist is just not history"

Which of the following statements best reflects the author's opinion ?

(A) Nationalists are highly imaginative.

(B) History is viewed through the filter of nationalism.

(C) Our colonial past never happened.

(D) Nationalism has to be both adequately and properly imagined.

10. The expression $\dfrac{(x+y)-|x-y|}{2}$ is equal to

(A) the maximum of x and y

(B) the minimum of x and y

(C) 1

(D) None of the above