Section-I: General Aptitude

1. The values of x which satisfy $(x-1)(x)(x+1) \le 0$ is / are

   i. $x \le 0$; ii. $x \le -1$ iii. $0 \le x \le 1$

   (A) Only I (B) Both ii and iii (C) Both i and ii (D) Both i and iii

2. Gateforum awarded annual bonuses to its employees. Of the employees at the company, 70% received bonuses of at least 10,000, 40% received bonuses of at least 50,000, and 20% received bonuses of at least 1,00,000. If 60 employees received bonuses of less than 10,000, how many employees received bonuses of at lest 50,000 but less than 1,00,000?

   (A) 80 (B) 50 (C) 48 (D) 40

3. A sum of money compounded annually amounts to thrice itself in 10 years. In how many years, will it become 9 times itself?

   (A) 6 (B) 8 (C) 10 (D) 12

4. Babita was asked to calculate the arithmetic mean of ten positivetwo digit integers. By mistake, she interchanged the two digits, say t and u, in one of these ten integers. As a result, her answer for the arithmetic mean was 1.8 more than what it should have been. Then u - t equals

   (A) 1 (B) 2 (C) 3 (D) 4

5. Operating alone, Tap A takes twice as long as Tap B takes to fill an empty tank. Operating together at their respective constant rates, the taps can fill the tank in 6 hours. How many hours would it take the Tap A to fill the tank operating alone?

   (A) 18 (B) 9 (C) 12 (D) 15

6. A shopkeeper sells two items at the price of Rs.160. If one of them is sold at 10% profit and another sold at 10% loss, then find the profit/loss?

   (A) 3.23 (B) 5.75 (C) 2.5 (D) 6.9

7. The sum of ages of 5 children born at interval of 3 years each is 50 years. What is the age of youngest child?

   (A) 10 (B) 2 (C) 7 (D) 4

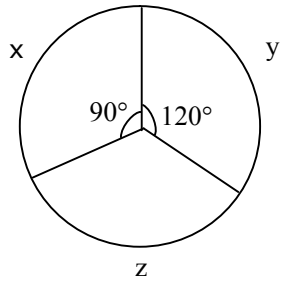
8. The cost of the components x, y, z of a machine worth Rs.45,000 in 1996 is given as a pie chart ? In the following year, the cost of the components x, y, z increased by 10%, 30%, and 20% respectively. What is the cost of the machine in 1997?

   (A) 54375

   (B) 52375

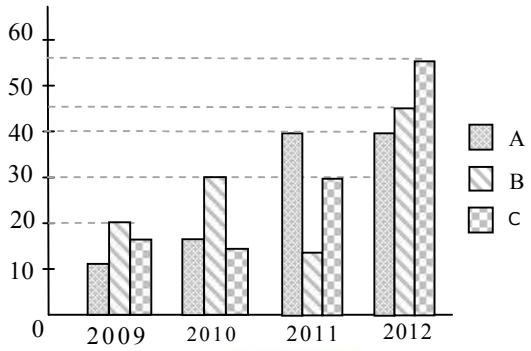
   (C) 54475

   (D) 54365



9. What is the 2777th digit in the sequence 1 2 3 4 5 6 7 8 9 10 11 12 13 14…..?
(A) 9 (B) 3 (C) 7 (D) 6

10. Production of sugar (in thousand tons) by three sugar mills over the year



Which of the statement is true ?
i. Ratio between the production of B in 2011 to C in 2012 is 3 :11
ii. Average production of A in four years is 20
iii. Percentage increase in C in 2011 from the previous year is 100%
(A) i & ii only (B) ii & iii only
(C) i & iii only (D) i, ii & iii

11. "Students who hired a hack to write their projects were punished"
Choose the best assumption for the given statement:
(A) Students have become mischievous
(B) Hack's are intelligent
(C) Hiring a hack is inexpensive
(D) Students have projects to be done

12. Find out the error part in the given sentence
Rajesh is/ smarter enough/ to get selected for his post/ without any recommendations
(A) (B) (C) (D)

13. Arrange the given parts of the sentence in correct order:
and recognize / all of us must / the machine tool industry / in the Country/
[1] [2] [3] [4]
strategic and vital / have a deep introspection / the fact that /
[5] [6] [7]
has a very special place / from the point / interests of the nation.
[8] [9] [10]
(A) 2,4,7,8,6,9,1,10,3,5 (B) 2,6,5,8,4,3,1,7,10,9
(C) 2,3,8,9,6,7,10,4,1,5 (D) 2,6,1,7,3,8,4,9,5,10

14. Choose the appropriate word which gives the meaning of the sentence given:
A critical situation in which no progress can be made:
(A) Hullabaloo (B) Aggression (C) Histrionic (D) impasse

15. There was once a newspaper vendor who had a rude customer. Every morning the customer throws the money at the vendor. The vendor would pick up the money, smile politely and say, "Thank you sir". The vendor's assistant asked him "why are you always polite with him when he is so rude to you". The vendor replied "He can't help being rude and I can't help being polite".
What is vendor's conclusion?
(A) Strive for excellence (B) Work is worship
(C) Rebels do not realize (D) Keep faith in our own ideas

16. In 1991, produce growers began using a new, inexpensive pesticide, provoking many objections that they would damage both the environment and the produce they were growing. However, the fears have proven unfounded as, though 1996, produce prices had dropped and no ill effects had been reported.
Which of the following, if true, would be the strongest objection to the argument above?
(A) Consumption of the produce declined from 1991 to 1993, but rose sharply from 1994 to 1996.
(B) Several areas in which use of the pesticide was forbidden have also experienced a drop in produce prices.
(C) The amount of produce grown in 1991 was larger than that of 1996.
(D) The time since the beginning of the use of the pesticide has been too short to allow
some of the predicted effects to occur.

17. Choose the appropriate antonym for the bold word **Linger**
(A) Sojourn (B) Fiery (C) Condone (D) Quilt

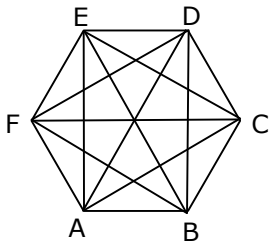
18. Find the proper meaning of the word given in bold letters
APP won the election **fair and square.**
(A) Honestly (B) Falsely (C) Corruptedly (D) Unexpectedly

19. None but the rich can afford air travel. Some of those who travel by air become sick. Some of those who become sick require treatment.
Choose the best conclusion:
(A) All the rich travel by air
(B) All the persons who travel by air become sick
(C) All sick persons travel by air
(D) Only rich can travel by air

20. **Sentence completion**
According to Maslow's theory of need hierarchy, material is the _____ demand of human beings, in that it provides the founding floor from which the other demands are generated.
(A) essential (B) basic (C) final (D) emotional

Section-II: Technical

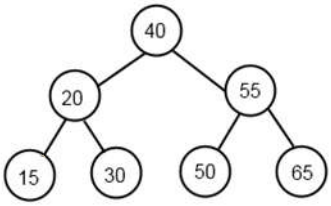
1. Consider the following graph $G(V,E)$:



Find the number of spanning trees for the above graph ?

(A) 1012 (B) 1296 (C) 1214 (D) None of these

2. Consider the following AVL tree.



Find the number of rotations performed after inserting 80, 75, 70 and 68?

(A) 4 (B) 5 (C) 6 (D) None of these

3. $\underset{x\to\infty}{Lt}\left[\frac{x^2+5x+3}{x^2+x+2}\right]^x =$

(A) e^4 (B) e^3 (C) e^2 (D) e

4. Which of the following pre-order traversals represents a valid binary search tree?

(A) 1 3 2 4 5 7 8 6 (B) 4 3 2 1 5 7 8 6

(C) 4 2 1 3 7 8 6 5 (D) 3 2 1 5 4 7 6 8

5. Consider any general function $f: A \to B$, where cardinality of set A is 'm' and that of set B is 'n' $(n \geq m)$.

Find the total number of possible functions and number of many to one functions respectively.

(A) $m^n, m^n - {}^mP_n$ (B) $n^m, n^m - {}^nP_m$

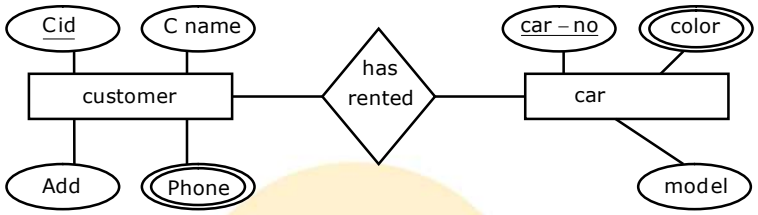
(C) $m^n, {}^mP_n$ (D) $n^m, n^m \left\{ {}^nP_m = \frac{n!}{(n-m)!} \right\}$

6. A relation R is defined on the set $A = \{2,3,4,5.....20\}$ as follows xRy, if their greatest prime divisor is same $\forall x, y \in A$.

How many equivalence classes the relation R contains?

(A) 7 (B) 6 (C) 4 (D) 8

7. The ER diagram shown below depicts a car rental scheme, where every customer can take more than 1 car for rent, or 1 car may be rented to multiple customers.



If the above ER diagram is mapped to a relational model, to correctly depict above scenario, the minimum number of required relations is

(A) 3 (B) 2 (C) 5 (D) 8

8. Consider a relation R(ABCD) with FD's { A → B, A → C, BC → D }. Answer the following:

(i)What is the highest normal form of this relation?

(ii)Does this relation have any redundancy in it?

(A) 3NF, NO (B) 2NF, NO (C) 3NF, YES (D) 2NF, YES

9. $\oint_c (xy + y^2)dx + x^2dy =$ _____ where C is the closed curve of the region bounded by y=x and $y=x^2$

(A) 1/20 (B) -1/20 (C) 1/40 (D) -1/40

10. List of keys (k) = 6,17,23,34, 48, 99 are inserted into the hash table by using hash function H=k mod table size and table size is 10. For resolving collisions linear probing is used. Find the number of collisions occurred when we insert new element '103'.

(A) 3 (B) 2 (C) 8 (D) 4

11. What would be the output of the following SQL query on EMP table?

```
SELECT *
FROM   EMP
 WHERE eno  > ANY ( SELECT   eno FROM EMP
                          WHERE        1 = 2 );
```

(A) Error (B) All rows of EMP table

(C) No Rows (D) None of these

12. Which of the following statements are not true?

1. All unsafe states are deadlocks
2. A deadlock state is unsafe state
3. A system is in safe state only if there exists a safe sequence
4. A state is said to be safe if the system can allocate resources to few processes even if all of them suddenly request their maximum number of resources.

(A) 3 & 4 only (B) 1 & 4 only
(C) 2 & 3 only (D) 1, 3 & 4 only

13. Given below are the processes which arrived simultaneously in given order at time '0' units and their CPU burst time. Find average waiting time using Round-Robin algorithm (time quantum=4 ms) and maximum time for which a process has to wait at most in this schedule.

Process	CPU time
P1	7
P2	4
P3	3
P4	4

(A) 9.5ms, 10ms (B) 9.5ms, 12 ms
(C) 8.5ms, 10ms (D) 8.5ms, 11ms

14. Consider a process that has been allocated 3 page frames. Assume that system uses pure demand paging. While undergoing execution, the process makes the following sequence of page references

1,4,5,1,6,3,1,3,2,4,5,1

If optimal page replacement policy is used, then the number of page faults for the above reference string is

(A) 7 (B) 6 (C) 8 (D) None of these

15. Consider expression $2+7\,\hat{}\,2-9*4+6\div 2$ (where ^ is exponential operator).

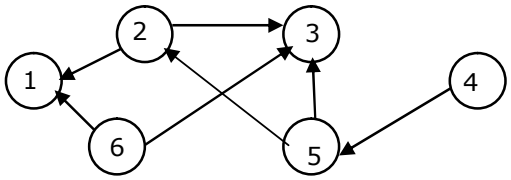
What will be the contents of stack starting from 'top' pointer when evaluating the postfix expression of the given expression after scanning the 8^{th} symbol?

(A) 16 (B) 19 (C) 16, 3 (D) 36, 51

16. The solution for contour integral $\oint_{|z|=1} e^{1/z} \sin\frac{1}{z} dz$ is

(A) $2\pi i$ (B) πi (C) 0 (D) $5\pi i$

17. Consider the following graph:



Which one of the following is a topological sort for the above graph?

(A) 1, 6, 2, 5, 3, 4 (B) 4, 5, 6, 3, 2, 1

(C) 6, 4, 5, 2, 1, 3 (D) None of these

18. A full 3-ary tree is one in which every node has 0 or 3 children. If a full 3-ary tree has 67 nodes, number of leaves in that tree is?

(A) 48 (B) 41 (C) 45 (D) 39

19. Consider the following C-Code;

```
static int i =10;
int   call(int n)
{
      static int i= 5;
      if(n < 100)
      {
         n=n+i;
         i= getl(i)+n;
         return call(n);
      }
      else return 2*n;
}

int getl(int x)
{
      x=x+i;
      i=x;
      return x;
}
```

What value will be returned by call(10)?

(A) 135 (B) 470 (C) 270 (D) None of these

20. The numbers 32, 56, 87, 23, 65, 26, 93 are to be inserted into a hash table of size 7. The hash table implementation uses function as (mod 7) and linear probing to resolve collision. After inserting the given numbers into the hash table if you apply bubble sort on the final content of the table, then after one pass of bubble sort, the content of the table will be

(A) 56, 23, 87, 32, 65, 26, 93 (B) 23, 32, 56, 65, 26, 87, 93

(C) 56, 93, 23, 87, 32, 26, 65 (D) None of these

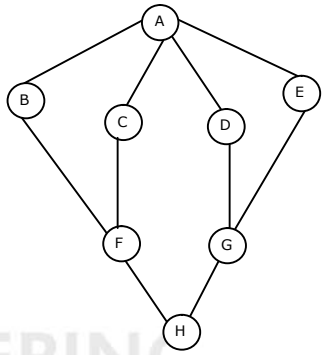
21. The solution of recurrence relation
$a_n - 3.a_{n-1} = 3^n(n+2)$ is …..

(A) $a_n = \frac{3^n}{2}\left(2C_1 + n^2 + 5n\right)$ (B) $a_n = 3^n\left(2C_1 + n^2 + 5n\right)$

(C) $a_n = \frac{3^n}{2}\left(C_1 + n^2 + n\right)$ (D) $a_n = 3^n\left(C_1 + n^2 + 5n\right)$

22. A graph is said to be 2-colourable if each vertex can be coloured either red or blue and no two vertices of the same colour are connected by an edge. If some graph is not 2-colorable, then we can reduce it to become 2-colorable by deleting some edges. We are given any simple graph with 101 nodes. *k* is the least required number of edges we have to delete in order to make this graph 2-colorable (Eg: *k*=0 for a graph which is already 2-colorable).
The minimum value for 'k' to reach the worst case is
(A) 2500 (B) 2600 (C) 2425 (D) 2625

23. Consider the following graph:
How many different breadth-first search traversals are possible considering H as a source vertex?
(A) 1
(B) 4
(C) 16
(D) 8



24. What can be the contents of stack from bottom to top at a time instant in evaluating the postfix expression: 584/+32*–(assume numbers are of 1 digit size)?
(A) 7, 6 (B) 7, 5 (C) 6, 6 (D) 7, 1

25. If the elements 1, 2, 3, 4, 5, 6 are inserted into the Queue in that order and if an element can be deleted at any time from the queue, which of the following permutation can be obtained as output of Queue?
(A) 2 4 3 6 5 1 (B)1 2 3 4 5 6 (C)1 5 2 4 3 6 (D) 5 2 6 3 4 1

26. The record pointer, key field and block pointer of a 'B' tree are 8B, 10B, & 6B respectively. If the block size is 1kB, then find the order of the tree.
(A) 39 (B) 43 (C) 46 (D) 51

27. In a sorted set of n distinct elements we want to find the next higher element after some element y in the set using binary search. What is the runtime complexity of this operation?
(A) O (n) (B) O (log n) (C) O (n log n) (D) $O(n^2)$

28. Say a system uses shortest job first scheduling (SJF) and exponential average of the measured lengths of previous CPU bursts, where α =0.25. If the initial value of the predicted CPU burst time, τ_1= 4 unit. The predicted time for 4thCPU burst (τ_4) for a process with burst times of 4 unit, 12 unit and 8 unit respectively is

(A) 8 (B) 5.5 (C) 7.4 (D) 6.5

29. The virtual memory system uses the demand paging for its implementation. The probability of getting page faults is 0.25, the normal memory access time is 200 nanoseconds. If it takes 2 milliseconds to service a page fault, then what is effective memory access time?

(A) 500000 ns (B) 500075 ns (C) 500150 ns (D) 500250 ns

30. The time complexity of the following algorithm T(n), where n is the input size

T(n) = 1 if n <= 4

T(n) = 2 T(√n) + logn if n > 4

(A) Θ (log n) (B) Θ (n)

(C) Θ (log n)2 (D) Θ (log n log log n)