Dear Students,

The GATE Academy team has tried to provide the best memory based questions and answers, however if you find any discrepancy then write your doubts to The GATE Academy at: info@thegateacademy.com. The GATE academy owes no responsibility for any kind of error due to data insufficiency/misprint/human errors etc.
<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>No. of Ques.</th>
<th>Topics Asked in Paper (Memory Based)</th>
<th>Level of Ques.</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Mathematics</td>
<td>1 Marks:2</td>
<td>Probability, Limit, Calculus</td>
<td>Medium</td>
<td>12</td>
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<tr>
<td></td>
<td>2 Marks:5</td>
<td></td>
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<tr>
<td>Programming and Data structure</td>
<td>1 Marks:4</td>
<td>Pointer, Structure, Function, Recursion</td>
<td>Tough</td>
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<tr>
<td></td>
<td>2 Marks:3</td>
<td></td>
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<tr>
<td>Operating System</td>
<td>1 Marks:2</td>
<td>Thread, Scheduling, Critical Section, Page Replacement</td>
<td>Easy</td>
<td>6</td>
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<tr>
<td></td>
<td>2 Marks:2</td>
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<tr>
<td>Theory of Computation</td>
<td>1 Marks:2</td>
<td>Regular Grammar, Turing Machine, DFA</td>
<td>Easy</td>
<td>12</td>
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<tr>
<td></td>
<td>2 Marks:5</td>
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<tr>
<td>Computer Organization and Architecture</td>
<td>1 Marks:4</td>
<td>Cache Memory, Memory mapping, Pipe Line, Addressing mode</td>
<td>Medium</td>
<td>14</td>
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<td>2 Marks:5</td>
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<tr>
<td>Digital Circuits</td>
<td>1 Marks:2</td>
<td>Flip flop, Logic gate, K-map</td>
<td>Easy</td>
<td>4</td>
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<td></td>
<td>2 Marks:1</td>
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<tr>
<td>Discrete Mathematics and Graph Theory</td>
<td>1 Marks:3</td>
<td>Tree, Spanning tree, Graph theory, Combinatorics</td>
<td>Easy</td>
<td>5</td>
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<tr>
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<td>2 Marks:1</td>
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<tr>
<td>Data Base Management System</td>
<td>1 Marks:2</td>
<td>Functional dependency, SQL, Topple calculus, Relation algebra</td>
<td>Medium</td>
<td>8</td>
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<td>2 Marks:3</td>
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<tr>
<td>Computer Networks</td>
<td>1 Marks:2</td>
<td>Stop and wait protocol, CRC check, TCP protocol</td>
<td>Easy</td>
<td>8</td>
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<td>2 Marks:3</td>
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<td>Compiler Design</td>
<td>1 Marks:0</td>
<td>First Follow</td>
<td>Easy</td>
<td>2</td>
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<td>2 Marks:1</td>
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<tr>
<td>Design And Analysis of Algorithm</td>
<td>1 Marks:2</td>
<td>Asymptotic notation, Complex city, Greedy technique, Quick sort,</td>
<td>Medium</td>
<td>4</td>
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<tr>
<td></td>
<td>2 Marks:1</td>
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<tr>
<td>General Aptitude</td>
<td>1 Marks:5</td>
<td>Probability, Numerical ability, Passage, Grammar</td>
<td>Medium</td>
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<td>2 Marks:5</td>
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<td>Total</td>
<td>65</td>
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<td>100</td>
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**Faculty Feedback**

Majority of the question were concept based. CO, TOC and DSA weightage was comparatively high. GA was medium as compared to the last year.
GATE 2017 Examination*
Computer Science and Information Technology

Test Date: 11/02/2017
Test Time: 9:00 AM 12:00 PM
Subject Name: Computer Science and Information Technology

Section I General Aptitude

1. At least 2 men and 2 women are sitting in a round table. No women are right handed. Each woman sits such that at her left sits a right handed person. How many women are there?
   [Ans. *]

2. A K-digit number, if does not contains 0, 5, 9 then its probability =
   [Ans. *]
   \((0.7)^k\)

3. Between 1 and 500 find all those numbers divisible by 3 or 5 or 7 (both are inclusive)
   [Ans. *]
   274

4. Who are sitting opposite to each other?
   S
   R Table A
   M
   [Ans. *]
   M, S

5. If \(y \cdot 162 = \) perfect cube 
   i.e., \(y \cdot 162 = x^3\)
   Then find value of \(y\)
   [Ans. *]
   \(y = 18\)

6. Rahul returned from voyage and _______ to visit the temple
   (A) is wishing  
   (B) was wishing  
   (C) wished  
   (D) had wished
   [Ans. D]

7. What this expression represents
   \(\frac{(x + y)^2}{2 - |x - y|}\)
   [Ans. *]
   Minimum \((x, y)\)
Section II Technical

1. Consider a binary tree with 15 nodes then the minimum and maximum height of tree is (Note root at height 0)?
   (A) 4 and 5 respectively
   (B) 3 and 14 respectively
   (C) 4 and 14 respectively
   (D) 3 and 15 respectively
   [Ans. B]
   Minimum height = \lfloor \log(15) \rfloor = 3
   Maximum height = 15 - 1 = 14

2. In a tree with 10 vertices, what is the sum of degree of graph?
   [Ans. *]
   In a tree number of edges = 10 - 1 = 9
   \therefore \text{sum of degree} = 2 \times e
   2 \times 9 = 18

3. Between 1 and 500, how many numbers are divisible by 3 or 5 or 7?
   [Ans. *]
   Assume P(A) = \text{div}(3)
P(B) = \text{div}(5)
P(C) = \text{div}(7)
P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(A \cap C) + P(A \cap B \cap C)
   = 166 + 100 + 71 - 33 - 23 - 14 + 4
   = 271

4. Consider a undirected connected weighted graph with positive and distinct weight G = (V, E). Which of the following is correct?
   (i) Minimum spanning tree of G is always unique
   (ii) Shortest path between two nodes is always unique
   (A) Only I
   (B) Only II
   (C) Both of these
   (D) None of these
   [Ans. A]
   MST is always unique
   There could be multiple shortest paths

5. What is the output if fun1(5) is called?

   fun1(n)
   {
     if(n == 0)
     return;
     print(n);
     fun2(n-2)
     print(n);
   }
   [Ans. *]

   fun2(n)
   {
     if(n == 0)
     return;
     print(n);
     fun1(+ +n)
     print(n);
   }
6. With respect to page replacement policy, which of the following is true?
   (A) Random page replacement suffers from Belady’s Anamoly
   (B) LRU suffers from Belady’s Anamoly
   (C) 
   (D) 
   [Ans. A]

7. If \((p \rightarrow q) \rightarrow r\) is contradiction, what is \((r \rightarrow p) \rightarrow q\)?
   (A) A tautology 
   (B) A contradiction 
   (C) Always true when \(p\) false 
   (D) Always true when \(q\) true 
   [Ans. D]
   \((p \rightarrow q) \rightarrow r\) is contradiction, so \(r\) is false
   \((r \rightarrow p) \rightarrow q = (\neg r \lor p) \rightarrow q \)
   \(= \neg (\neg r \lor p) \lor q \)
   \(= (r \land \neg p) \lor q \)
   \(= \text{FALSE} \lor q \)
   \(= q \)
   \(\therefore (r \rightarrow p) \rightarrow q = q \)

8. What is the output?
   printlength (char * s, char * t)
   {
   int c = 0;
   int len = \[(\text{strlen}(s) - \text{strlen}(t)) > c\]
   \text{strlen}(s); \text{strlen}(t);
   printf(“\%d”,len);
   }
   void main(){
   x = "abc”;
   y = "defgh”;
   printlength(x,y);
   }
   [Ans. *]
   It prints length of bigger string
9. What is the output?
   ```java
   total(V){
       static int count = 0;
       while(V){
           count t = V & 1;
           V >>= 1;
       }
       Return count;
   }
   main(){
       static int x = 0;
       int i = 5;
       for(; i > 0; i --)
       {
           x = x + total(p);
       }
       Print f("%d",x);
   }
   [Ans.*]
   It prints sum of number of 1’s in binary equivalent of numbers 1 to 5
   
10. Find value of x
   \[
   \lim_{x \to 1} \frac{x^7 - 2x^5 + 1}{x^3 - 3x^2 + 2}
   \]
   [Ans.*]
   1

11. Which of the following is true?
\[
\sum_{i=1}^{n} \sum_{j=1}^{n} (A_{ij})^2 = 50
\]
   Rank of matrix = 2
   (a) Eigen value is \([-5, 5]\]
   (b) Eigen value less than 5
   [Ans.*]

12. Which of the following equivalent to \(~p \land \sim q\)
   (i) \ p - q
   (ii) \ q - p
   (iii) \ q \land \sim p
   (iv) \ p \lor \sim q
   (A) Only i  (C) Only ii
   (B) Only ii and iii (D) Only ii and iv
   [Ans. D]
13. Consider the following first order predicate logic
\[ \forall x (\exists y f(x, y)) \] is equivalent to
(i) \[ \exists y (\exists x f(x, y)) \]
(ii) \[ \exists y (\forall x f(x, y)) \]
(iii) \[ \forall y (\exists x f(x, y)) \]
(iv) \[ \sim \exists x (\forall y \sim f(x, y)) \]

(A) Only iv  
(B) Only i and iv  
(C) Only ii and ii  
(D) Only i and iii

[Ans. A]

14. Consider the following

<table>
<thead>
<tr>
<th>Process</th>
<th>Arrival time</th>
<th>Burst time</th>
</tr>
</thead>
<tbody>
<tr>
<td>p_1</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>p_2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>p_3</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>p_4</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

What is average waiting time if we use preemptive SRTF algorithm.

[Ans. *] 6.5

15. Consider multithread process that has x thread and y resource. Thread can apply lock on resource and it one thread apply lock on any resource and other thread apply lock on same resource result in conflict. So what is the minimum value of x and y to ensure deadlock,

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

[Ans. D]

16. Consider the following function
\[ n, \sqrt{n}, 10, \frac{100}{n}, \log_2 n \]
Which of the following is in increasing order of their complexity?

(A) \[ \sqrt{n}, n, 10, \frac{100}{n}, \log_2 n \]
(B) \[ \frac{100}{n}, 10, \log_2 n, \sqrt{n} \]
(C) \[ 10, \frac{100}{n}, \sqrt{n}, \log_2 n, n \]
(D) \[ n, 10, \sqrt{n}, \log_2 n, \frac{100}{n} \]

[Ans. B]

17. Consider an array of size 31 consisting number of O’s followed by number of I’s. for find the smallest value of i such that A[i] contain 1 the worst case number of comparison by optimal Algorithm is

[Ans. *]

Number of comparisons = \log_2 (32) + 1 = 6
18. Consider N words cache memory, each block consist B words if we use directed mapped cache then tag field requires 10 bits. Now at the place of direct mapped cache if we use 16 way set associative memory then number of bits in tag fields are ______
[Ans. *]
14 bits

19. Consider five stage pipeline (IF, ID, OF, PO, WB) with the state time 5, 2, 6, 20, 8 ns and the delay between stages is 2 ns. Then consider the following architecture
   (i) The pipeline with 5 stage
   (ii) The improved pipeline in which PO stage divided in two phase with phase time 12 and 8 ns
   So what is the speed up ratio ______
[Ans. *]
1.57

20. The minimum number of states in DFA for the following expression
    (a + b) * b(a + b)
[Ans. *]

21. Consider the following CFL
    \[ L_1 = \{ a^n b^n c^m | n, m \geq 0 \} \]
    \[ L_2 = \{ a^m b^n c^n | n, m \geq 0 \} \]
    Consider following two statements
    \[ S_1 = L_1 \cup L_2 \]
    \[ S_2 = L_1 \cap L_2 \]
    Which of the following is CFL?
    (A) \( S_1 \) only
    (B) \( S_2 \) only
    (C) Both of these
    (D) None of these
[Ans. *]

22. Consider the following grammar
    \[ G_1: S \rightarrow asb|T \quad T \rightarrow CT|e \]
    \[ G_2: S \rightarrow bsa|T \quad T \rightarrow CT|e \]
    \[ L = L(G_1) \cap L(G_2) \]
    Which of the following is true?
    (A) Finite
    (B) Not finite but regular
    (C) CFL
    (D) CSL but not CFL
[Ans. *]

23. Consider the set A and B and f(x) is a number of function from A to B. f(x) is computable if there exist Turing machine for x ∈ f(x) and Turing machine should halts for every input. Which of the following is true, language generated by f is \( L_0 = \{ \cdots \} \)
    (A) f is computable iff L is recursive
    (B) f is computable iff L is REL
    (C) if L is recursive then f is computable but reverse not true
    (D) if L is REL then f is computable but reverse not true.
[Ans. *]
24. Which of the following is shared by all the threads in a process?
   (A) Stack  (C) Register
   (B) Address space  (D) Program counter

25. Consider a quadratic equation, \(x^2 - 13x + 36 = 0\) which have the coefficients in base \(b\). The solution of the equation in base \(b\) is \(x = 5\) and \(x = 6\). Then what is the value of \(b\)?

26. Consider a snippet of the program as given below:
   ```cpp
   void printxy(int x, int y)
   {
     int *ptr;
     X = 0;
     X = &ptr;
     Y = *ptr;
     *ptr = 1;
     printf("%d, %d", x, y);
   }
   ```
   Then what is the output of the `printxy(1, 1)`?
   (A) 0, 0
   (B) 1, 0
   (C) 0, 1
   (D) 1, 1