

GATE-2012

Question Paper

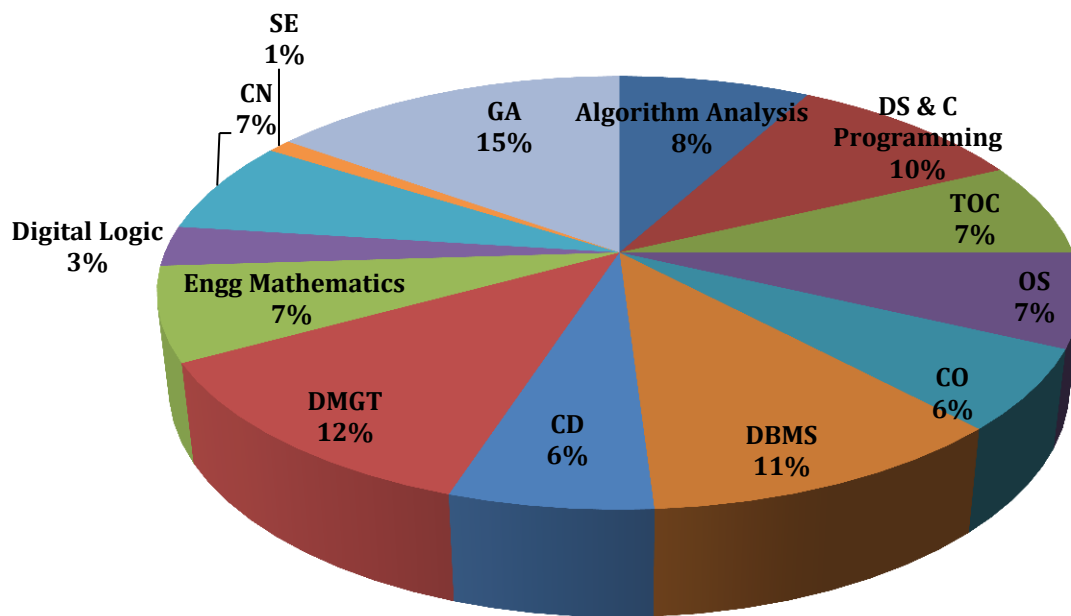
&

Answer Keys

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1. Question Paper Analysis
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Analysis of Gate 2012 Computer Science



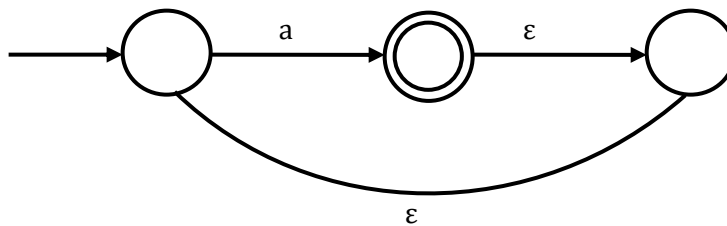
GATE-2012- CS

SUBJECT	NO OF QUESTION	Topics Asked in Paper	Total Marks
Algorithm Analysis	1M:2 2M:3	Dynamic Programing, Time and Space Complexity, Dynamic Programming	8
DS&C Programming	1M:2 2M:4	Data Structure and Algorithm Analysis, Stacks and Queues, Trees, Height Balanced Trees (AVL Trees, B and B+), Priority Queues (Heaps),	10
Theory of Computation	1M:3 2M:2	Finite Automata, Regular Expressions and Languages, Properties of Regular Languages, Context Free Grammars and Languages, Pushdown Automata, Properties of CFL Introduction to Turing Machines	7
Operating System	1M:1 2M:3	Process Management, Process Synchronization, Threads,CPU Scheduling, Deadlocks, Memory Management & Virtual Memory, File System,	7
Computer Organization	1M:2 2M:2	Introduction to Computer Organization, Pipeline, Instruction Types, Addressing Modes, I/O Data Transfer, Miscellaneous	6
Database and Management System	1M:3 2M:4	ER Diagrams, Functional Dependencies & Normalization, SQL, Relational Algebra &Relational Calculus, Transactions And Concurrency Control, File Structures,	11
Compiler Design	1M:0 2M:3	Syntax Analysis, Syntax Directed Translation, Run Time Environment, Intermediate Code Generation, Code Optimization,	6
DMGT	1M:4 2M:4	Mathematical Logic, Combinatorics, Sets & Relations, Graph Theory	12
Mathematics	1M:3 2M:2	Linear Algebra, Probability and Distribution, Numerical Methods, Calculus	7
Digital Logic	1M:1 2M:1	Number systems and code conversions, Boolean algebra & Karnaugh maps, Logic Gates, Logic Gates family, Combinational	3
Computer Network	1M:3 2M:2	Introduction, Medium Access Sublayer, The Data Link Layer, (Flow Control And Error Control), Routing And Congestion Control, TCP/IP, UDP And Sockets, IP(v4), Application	7
Software Engineering	1M:1 2M:0	Software and Software Engineering, Requirement Modeling, Process Modeling, Project Management, Testing	1
General Aptitude	1M:5 2M:5	Numerical Ability, Verbal Ability	15
Total	65		100

GATE 2012 Examination Computer Science

Q.1 - Q.25 Carry One Mark each.

1. What is the complement of the language accepted by the NFA shown below? Assume $\Sigma = \{a\}$ and ϵ is the empty string



- (A) \emptyset (C) a
 (B) $\{\epsilon\}$ (D) $\{a, \epsilon\}$
[Ans. B]

2. Let A be the 2×2 matrix with elements $a_{11} = a_{12} = a_{21} = +1$ and $a_{22} = -1$. Then the eigen values of the matrix A^{19} are
 (A) 1024 and -1024 (C) $4\sqrt{2}$ and $-4\sqrt{2}$
 (B) $1024\sqrt{2}$ and $-1024\sqrt{2}$ (D) $512\sqrt{2}$ and $-512\sqrt{2}$
[Ans. D]

3. The protocol data unit (PDU) for the application layer in the Internet stack is
 (A) Segment (C) Message
 (B) Datagram (D) Frame
[Ans. C]

4. Consider the function $f(x) = \sin(x)$ in the interval $x \in [\pi/4, 7\pi/4]$. The number and location (s) of the local minima of this function are
 (A) One, at $\pi/2$ (C) Two, at $\pi/2$ and $3\pi/2$
 (B) One, at $3\pi/2$ (D) Two, at $\pi/4$ and $3\pi/2$
[Ans. D]

5. A process executes the code
 Fork ();
 Fork ();
 Fork ();
 The total number of child processes created is
 (A) 3 (C) 7
 (B) 4 (D) 8
[Ans. C]

6. The decimal value 0.5 in IEEE single precision floating point representation has
 (A) Fraction bits of 000...000 and exponent value of 0
 (B) Fraction bits of 000...000 and exponents value of -1
 (C) Fraction bits of 000...000 and exponents value of -1
 (D) No exact representation

[Ans. B]

7. The truth table

X	Y	f(X,Y)
0	0	0
0	1	0
1	0	1
1	1	1

Represents the Boolean function

- (A) X (C) $X \oplus Y$
 (B) $X+Y$ (D) Y

[Ans. A]

8. The worst case running time to search for an element in a balanced in a binary search tree with v^2 elements is

- (A) $\Theta(n \log n)$ (C) $\Theta(n)$
 (B) $\Theta(n^{2^n})$ (D) $\Theta(\log n)$

[Ans. C]

9. Assuming $P \neq NP$, which of the following C program segment?

- (A) NP-complete = NP (C) NP-hard = NP
 (B) $NP\text{-complete} \cap P = \emptyset$ (D) $P = NP\text{-complete}$

[Ans. B]

10. What will be the output of the following C program segment?

```
Char inchar = 'A';
Switch (inchar) {
Case 'A' :printf ("choice A\ n");
Case 'B' :
Case 'C' : print f ("choice B");
Case 'D' :
Case 'E' :
Default : print f ("No Choice"); }
```

- (A) No choice
 (B) Choice A
 (C) Choice B
 Choice B No choice
 (D) Program gives no output as it is erroneous

[Ans. *]

11. Which of the following is TRUE?
- (A) Every relation in 2NF is also in 3CNF
 - (B) A relation R is in 3NF if every non-prime attribute of R is fully functionally dependent on every key of R
 - (C) Every relation in BCNF is also in 3NF
 - (D) No relation can be in both BCNF and 3NF

[Ans. C]

12. Consider the following logical inferences.
 I_1 : If it rains then the cricket match will not be played
 The cricket match was played
Inference: There was no rain
 I_2 : If it rains then the cricket match will not be played
 It did not rain

Inference: The cricket match was played

Which of the following is **True**?

- (A) Both I_1 and I_2 are correct inferences
- (B) I_1 is correct but I_2 is not correct inferences
- (C) I_1 is not correct I_2 is a correct inferences
- (D) Both I_1 and I_2 are not correct inferences

[Ans. B]

13. Given the language $L = \{ab, aa, baa\}$, which of the following strings are in L^* ?

- 1) abaabaaabaa
- 2) aaaabaaaa
- 3) baaaaabaaaab
- 4) baaaaabaa

(A) 1, 2 and 3

(C) 1, 2 and 4

(B) 2, 3 and 4

(D) 1, 3 and 4

[Ans. C]

14. Which of the following problems are decidable?
- 1) Does a given program ever produce an output?
 - 2) If L is a context-free language, then is \bar{L} also context-free?
 - 3) If L is a regular language, then is \bar{L} also regular?
 - 4) If L is a recursive language, then, is \bar{L} also recursive?

(A) 1, 2, 3, 4

(C) 2, 3, 4

(B) 1, 2,

(D) 3, 4

[Ans. D]

15. In the IPv4 addressing format, the number of network allowed under Class C address is

(A) 2^{14}

(C) 2^{21}

(B) 2^7

(D) 2^{24}

[Ans. C]

16. Which of the following transport layer protocol is used to support electronic mail?
 (A) SMTP (C) TCP
 (B) IP (D) UDP
[Ans. C]
17. Consider a random variable X that takes value + 1 and -1 with probability 0.5 each. The value of the cumulative distribution function F(x) at x = -1 and +1 are
 (A) 0 and 0.5 (C) 0.5 and 1
 (B) 0 and 1 (D) 0.25 and 0.75
[Ans. C]
18. Register renaming is done in pipelined processors
 (A) As an alternative to register allocation at compile time
 (B) For efficient access to function parameters and local variables
 (C) To handle certain kinds of hazards
 (D) As part of address translation
[Ans. C]
19. The amount of ROM needed to implement a 4 bit multiplier is
 (A) 64 bits (C) 1 kbits
 (B) 128 bits (D) 2kbits
[Ans. D]
20. Let $w(n)$ and $A(n)$ denote respectively, the worst case and average case and average case running time of an algorithm executed on an input of size n. which of the following is **ALWAYS TRUE**?
 (A) $A(n) = \Omega(W(n))$ (C) $A(n) = O(W(n))$
 (B) $A(n) = \Theta(W(n))$ (D) $A(n) = o(W(n))$
[Ans. C]
21. Let G be a simple undirected planar graph on 10 vertices with 15 edges. If G is a connected graph, then the number of **bounded** faces in any embedding of G on the plane is equal to
 (A) 3 (C) 5
 (B) 4 (D) 6
[Ans. D]
22. The recurrence relation capturing the optimal time of the tower of Hanoi problem with n discs is
 (A) $T(n) = 2T(n - 2) + 2$ (C) $T(n) = 2T(n/2) + 1$
 (B) $T(n) = 2T(n - 1) + n$ (D) $T(n) = 2T(n - 1) + 1$
[Ans. D]
23. Which of the following statements are **TRUE** about an SQL query?
 P: An SQL query can contain a HAVING clause even if it does not a GROUP BY clause
 Q: An SQL query can contain a HAVING clause only if it has a GROUP BY clause
 R: All attributes used in the GROUP BY clause must appear in the SELECT clause
 S: Not all attributes used in the GROUP BY clause need to appear in the SELECT clause
 (A) P and R (C) Q and R
 (B) P and S (D) Q and S
[Ans. C]

24. Given the basic ER and relational models, which of the following is **INCORRECT**?
- (A) An attributes of an entity can have more that one valye
 - (B) An attribute of an entity can be composite
 - (C) In a row of a relational table, an attribute can have more than one value
 - (D) In a row of a relational table, an attribute can have exactly one value or a NULL value
- [Ans. C]**

25. What is the correct translation of the following statement into mathematical logic?
"some real number are rational"
- (A) $\exists x(\text{real}(x) \vee \text{rational}(x))$
 - (B) $\forall x (\text{real}(x) \rightarrow \text{rational}(x))$
 - (C) $\exists x (\text{real}(x) \wedge \text{rational}(x))$
 - (D) $\exists x (\text{rational}(x) \rightarrow (x))$
- [Ans. C]**

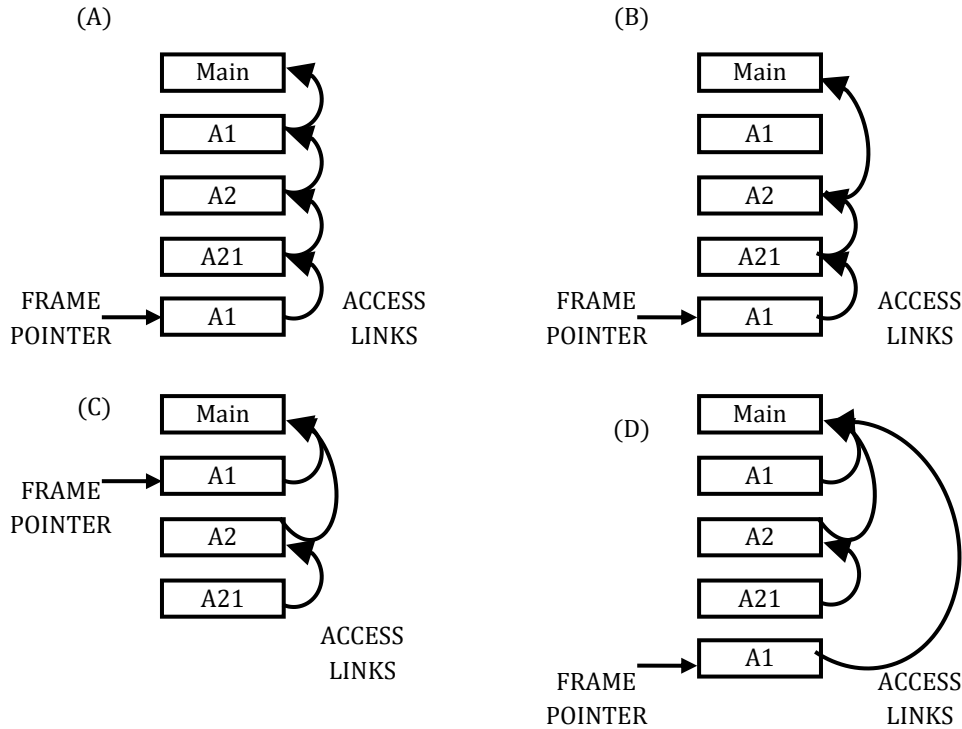
Q. 26 to Q. 55 carry two marks each.

26. Consider the program given below, in a block-structured pseudo-language with lexical scoping and nesting of procedures permitted

```
Program main;  
Var...  
Procedure A1;  
Var ...  
Call A2;  
End A1  
Procedure A2;  
Var...  
Procedure A21;  
Var ...  
Call A1;  
End A21  
Call A21;  
End A2  
Call A1;  
End main.
```

Consider the calling chain: main \rightarrow A1 \rightarrow A2 \rightarrow A21 \rightarrow A1

The correct set of activation recodes along with their access links is given by



[Ans. D]

27. Suppose a circular queue of capacity $(n - 1)$ elements is implemented with an array of n elements. Assume that the insertion and deletion operation are carried out using REAR and FRONT as array index variables, respectively. Initially, $REAR = FRONT = 0$. The conditions to detect queue full and queue empty are
- | | |
|---|---|
| (A) Full: $(REAR+1) \bmod n == FRONT$
empty: $REAR == FRONT$ | (C) Full: $REAR == FRONT$
empty: $(REAR+1) \bmod n == FRONT$ |
| (B) Full: $(REAR+1) \bmod N == FRONT$
empty: $(FRONT+1) \bmod n == REAR$ | (D) Full: $(FRONT+1) \bmod n == REAR$
empty: $REAR == FRONT$ |

[Ans. A]

28. An internet service provider (ISP) has the following chunk of CID-based IP address available with ti: 245.248.128.0/20. The ISP wants to give half of this chunk of addresses to Organization A, and a quarter to Organization B, while retaining with itself. Which of the following of a valid allocation of addresses to A and B?
- (A) 245.248.136.0/21 and 245.248.128.0/22
 (B) 245.248.128.0/21 and 245.248.128.0/22
 (C) 245.248.132.0/22 and 245.248.132.0/21
 (D) 245.248.136.0/24 and 245.247.132.0/21

[Ans. A]

29. Suppose a fair six-sided die is rolled once. If the value on the die is 1, 2, or 3, the die is rolled a second time. What is the probability that the sum total of value that turn up is at least 6?
- | | |
|-----------|---------|
| (A) 10/21 | (C) 2/3 |
| (B) 5/12 | (D) 1/6 |

[Ans. B]

30. Fetch_And_Add (X, i) is an atomic Read-modify-write instruction that reads the value of memory location X, increments it by the value I, and returns the old value of X, it is used in the pseudocode shown below to implement a busy-wait lock. L is an unsigned integer, while any non-zero value corresponds to the lock being not available.

```
AcquireLock(L){
While (Fetch_And_Add(L, 1))
}
releaseLock (L){
L = 0;
}
```

This implementation

- (A) Fails as L can overflow
 - (B) Fail as L can take on a non-zero value when the lock is actually available
 - (C) work correctly but may starve some processes
 - (D) work correctly without starvation
- [Ans. B]**

31. consider the 3 processes, P1, P2 and P3 shown in the table

Process	Arrival time	Time unit required
P1	0	5
P2	1	7
P3	3	4

The completion order of the 3 processes under the policies FCFS and RRS (round robin scheduling with CPU quantum of 2 time units) are

- (A) FCFS: P1, P2, P3 RR2: P1, P2, P3
 - (B) FCFS: P1, P3, P2 RR2: P1, P3, P2
 - (C) FCFS: P1, P2, P3 RR2: P1, P3, P2
 - (D) FCFS: P1, P3, P2 RR2: P1, P2, P3
- [Ans. C]**

32. What is the minimal form of the Karnaughy map shown below? Assume that X denotes a don't care term

	ab			
cd	00	01	11	10
00	1	X	X	1
01	X			1
11				
10	1			X

- (A) $\bar{b}\bar{d}$
 - (B) $\bar{b}\bar{d} + \bar{b}\bar{c}$
 - (C) $\bar{b}\bar{d} + a\bar{b}\bar{c}d$
 - (D) $\bar{b}\bar{d} + \bar{b}\bar{c} + \bar{c}\bar{d}$
- [Ans. B]**

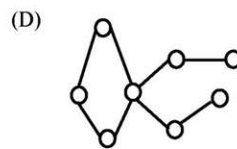
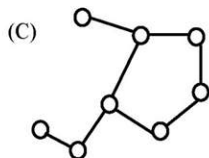
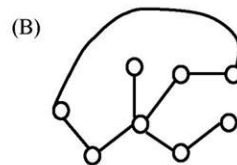
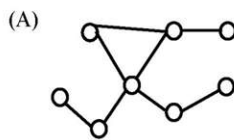
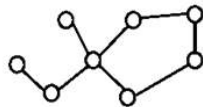
33. Let G be weighted graph with edge weights greater than one G' be the graph constructed by squaring the weights of edges in G . Let T and T' be the minimum spanning trees of G and G' respectively, with total weights t and t' . which of the following statements is TRUE?
 (A) $T' = T$ with total weight $t' = t^2$ (C) $T' \neq T$ with total weight $t' = t^2$
 (B) $T' = T$ with total weight $t' < t^2$ (D) None of the above

[Ans. *]

34. The bisection method is applied to compute a zero of the function $f(x) = x^4 - x^3 - x^2 - 4$ in the interval; $[1, 9]$. The method converges to a solution after ____ iterations.
 (A) 1 (C) 5
 (B) 3 (D) 7

[Ans. B]

35. Which of the following graphs is isomorphic to

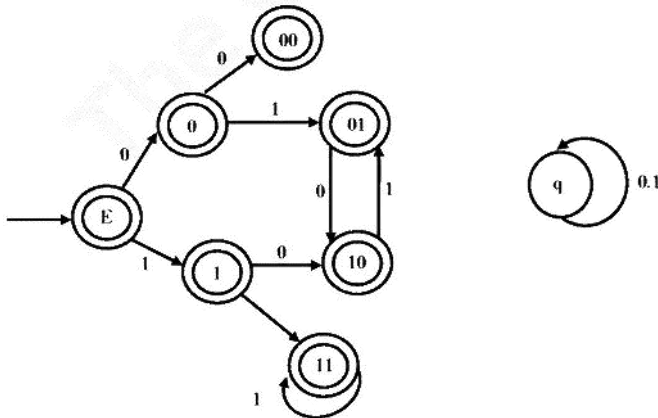


[Ans. B]

36. Consider the following transactions with data items P and Q initialized to zero:
 T_1 : read (P);
 read(Q);
 if $P = 0$ then $Q := Q + 1$;
 write (Q).
 T_2 : read(Q);
 read (P);
 If $Q = 0$ then $P := P + 1$; write (P).
 Any non-serial interleaving of T_1 and T_2 for concurrent execution leads to
 (A) A serializable schedule
 (B) A schedule that is not conflict serializable
 (C) A conflict serializable schedule
 (D) A schedule for which a precedence graph cannot be drawn

[Ans. B]

37. Consider the set of strings on $\{0,1\}$ in which, every substring of 3 symbols has at most two zeros. For examples, 001110 and 011001 are in the language, but 100010 is not. All strings of length less than 3 are also in the language. A partially completed DFA that accepts this language is shown below.



The missing arcs in the DFA are

(A)

	00	01	10	11	q
00	1	0			
01				1	
10	0				
11			0		

(B)

	00	01	10	11	q
00		0			1
01		1			
10				0	
11		0			

(C)

	00	01	10	11	q
00		1			0
01		1			
10			0		
11		0			

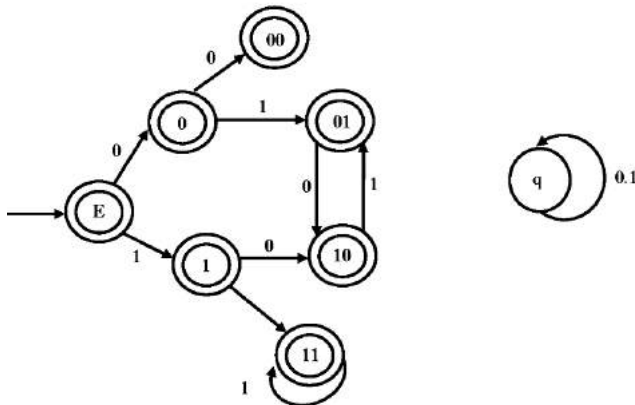
(D)

	00	01	10	11	q
00		1			0
01				1	
10	0				
11			0		

[Ans. D]

38. The height of a tree is defined as the number of edges on the longest path in the tree. The function shown in the pseudo code below is invoked as height (root) to compute the height of a binary tree rooted at the tree pointer root.

```
int height (treeptr n)
{ if (n == NULL)
  return -1; if(n->left ==
    NULL)
    if (n->right == NULL) return 0;
    else return B1 // Box 1
```



```
else { h1 = height (n->left);
if (n->right == NULL) return (1 +
h1); else { h2 = height (n->right);
return B2 //Box 2
}
}
}
```

The appropriate expression for the two boxes B1 and

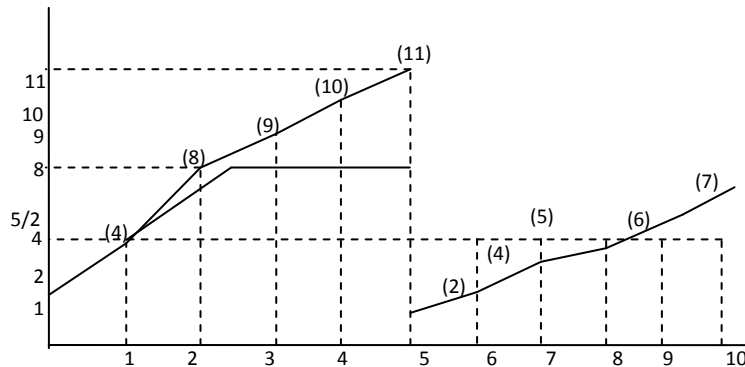
- | | |
|--------------------------------|----------------------------------|
| (A) B1 : (1 + height(n→right)) | (C) B1 : height(n → right) |
| B2:(1 +max(h1,h2)) | B2 : max(h1,h2) |
| (B) B1 : (height(n → right)) | (D) B1 : (1 + height(n → right)) |
| B2 :(1+max(h1,h2)) | B2: max (h1,h2) |

[Ans. B]

39. Consider an instance of TCP's Additive Increase multiplicative Decrease (AIMD) algorithm where the window size at the start of the slow start phase is 2 MSS and the threshold at the start of the first transmission is 8 MSS. Assume that a timeout occurs during the fifth transmission. Find the congestion window size at the end of the tenth transmission.

- | | |
|------------|------------|
| (A) 8 MSS | (C) 7 MSS |
| (B) 14 MSS | (D) 12 MSS |

[Ans. *]



40. Consider a source computer (S) transmitting a file size 10^6 bits to a destination computer (D) over a network of two routers (R_1 and R_2) and three (L_1, L_2 , and L_3). L_1 connects S to R_1 ; L_2 connects R_1 to R_2 ; and L_3 connects R_2 to D. Let each link be length 100 km. Assume signals travel over each link at a speed of 10^8 meters per second. Assume that the link bandwidth on each link is 1Mbps. Let the file be broken down into 1000 packets each of size 1000bits. Find the total sum of transmission and propagation delays in transmitting the file from S to D?

- (A) 1005 ms (C) 3000 ms
(B) 1010 ms (D) 3003 ms

[Ans. A]

41. Suppose $R_1(A, B)$ and $R_2(C, D)$ are two relation schemas. Let r_1 and r_2 be the corresponding relation instances. B is a foreign key that refers to C in R_2 . If data in r_1 and r_2 satisfy referential integrity constraints, which of the following is **ALWAYS TRUE**?

- (A) $\prod_B(r_1) - \prod_C(r_2) = \emptyset$ (C) $\prod_B(r_1) - \prod_C(r_2)$
(B) $\prod_C(r_2) - \prod_B(r_1) = \emptyset$ (D) $\prod_B(r_1) - \prod_C(r_2) \neq \emptyset$

[Ans. A]

42. Consider the virtual page reference string
1,2,3,4, 1,3,2,4,1

On a demand paged virtual memory system running on a computer system that main memory size of 3 page frames which are initially empty. Let LRU, FIFO and OPTIMAL denote the number of page faults under the corresponding page replacements policy. Then

- (A) OPTIMAL < LRU < FIFO (C) OPTIMAL = LRU
(B) OPTIMAL < FIFO < LRU (D) OPTIMAL = FIFO

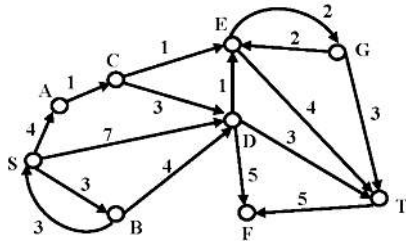
[Ans. B]

43. A file system with 300 GByte uses a file descriptor with 8 direct block address, 1 indirect block address and 1 doubly indirect block address. The size of each disk block is 128 Bytes and the size of each disk block address is 8Bytes. The maximum possible file size in this file system is

- (A) 3 Kbytes (C) 280 Bytes
(B) 35 Kbytes (D) Dependent on the size of the disk

[Ans. B]

44. Consider the directed graph shown in the figure below. There are multiple shortest paths between vertices S and T. Which one will be reported by Dijkstra's shortest path algorithm? Assume that, in any iteration, the shortest path to a vertex v is updated only when a strictly shorter path to v is discovered.



- (A) SDT (C) SACDT
(B) SBDT (D) SACET

[Ans. D]

45. A list of n strings, each of length n , is sorted into lexicographic order using the merge-sort algorithm. The worst case running time of this computation is

- (A) $(n \log n)$ (C) $O(n^2 + \log n)$
(B) $(n^2 \log n)$ (D) $O(n^2)$

[Ans. *]

46. Let G be a complete undirected graph on 6 vertices. If vertices of G are labeled, then the number of distinct cycles of length 4 in G is equal to

- (A) 15 (C) 90
(B) 30 (D) 360

[Ans. *]

47. How many onto (or surjective) functions are there from an n -element ($n \geq 2$) set to a 2-element set?

- (A) 2^n (C) $2^n - 2$
(B) $2^n - 1$ (D) $2(2^n - 2)$

[Ans. C]

Common Data for Questions 48 and 49:

Id	Name	Age
12	Arun	60
15	Shreya	24
99	Rohit	11

Id	Name	Age
15	Shreya	24
25	Hari	40
98	Rohit	20
99	Rohit	11

Id	Phone	Area
10	2200	02
99	2100	01

48. How many tuples does the result of the following relational algebra expression contain? Assume that the schema of A ∪ B is the same as that of A.

$$(A \cup B) \bowtie_{A.Id > 40 \vee C.Id < 15} C$$

- (A) 7 (C) 5
(B) 4 (D) 9

[Ans. A]

49. How many tuples does the result of the following SQL query contains?

```
SELECT A.Id
FROM A
WHERE A.Age > ALL (SELECT B.Age
                  FROM B
                  WHERE B.name = „Arun“)
```

- (A) 4 (C) 0
(B) 3 (D) 1

[Ans. B]

Common Data for Question 50 and 51:

Consider the following C code segment.

```
int a, b, c = 0;
void prtFun (void) ;
Main ()
{ static int a = 1; /* line 1 */
  prtFun ();
  a += 1;
  prtFun ();
  printf ( " \n %d %d ", a, b );
}
void prtFun (void
)
{ static int a = 2; /* line 2 */
  int b = 1;
  a += ++b;
  printf ( " \n %d %d ", a, b );
}
```

50. What output will be generated by the given code segment?

- | | | | | | | | |
|-------|---|-------|---|-------|---|-------|---|
| (A) 3 | 1 | (B) 4 | 2 | (C) 4 | 2 | (D) 3 | 1 |
| 4 | 1 | 6 | 1 | 6 | 2 | 5 | 2 |
| 4 | 2 | 6 | 1 | 2 | 0 | 5 | 2 |

[Ans. C]

51. What output will be generated by the given code segment if:

Line 1 is replaced by **auto int a = 1;**

Line 2 is replaced by **register int a = 2;**

- (A) $\begin{matrix} 3 & 1 \\ 4 & 1 \\ 4 & 2 \end{matrix}$ (B) $\begin{matrix} 4 & 2 \\ 6 & 1 \\ 6 & 1 \end{matrix}$ (C) $\begin{matrix} 4 & 2 \\ 6 & 2 \\ 2 & 0 \end{matrix}$ (D) $\begin{matrix} 4 & 2 \\ 4 & 2 \\ 2 & 0 \end{matrix}$

[Ans. D]

Statement for linked Answer Question 52 and 53:

For the grammar below, a partial LL(1) parsing table is also presented along with the grammar. Entries that need to be filled are indicated as **E1, E2, and E3**, ϵ is the empty string, \$ indicates end of input, and, | separates alternate right hand side of productions.

$S \rightarrow a A b B \mid b A a B \mid \epsilon$

$A \rightarrow S$

$B \rightarrow S$

	a	B	\$
s	E1	E2	$S^{\wedge}\epsilon$
A	$A \rightarrow S$	$A \rightarrow S$	Error
B	$B \rightarrow S$	$B \rightarrow S$	E3

52. The FIRST and FOLLOW sets for the non-terminals A and B are
- (A) $\text{FIRST}(A) = \{a,b,\epsilon\} = \text{FIRST}(B)$
 $\text{FOLLOW}(A) = \{a,b\}$
 $\text{FOLLOW}(B) = \{a,b,\$ \}$
- (B) $\text{FIRST}(A) = \{a,b,\$ \}$
 $\text{FIRST}(B) = \{a,b,\epsilon\}$
 $\text{FOLLOW}(A) = \{a,b\}$
- (C) $\text{FOLLOW}(B) = \{\$ \}$
 $\text{FIRST}(A) = \{a,b,\epsilon\} = \text{FIRST}(B)$
 $\text{FOLLOW}(A) = \{a,b\}$
 $\text{FOLLOW}(B) = \emptyset$
- (D) $\text{FIRST}(A) = \{a,b,\epsilon\} = \text{FIRST}(B)$
 $\text{FOLLOW}(A) = \{a,b\}$
 $\text{FOLLOW}(B) = \{a,b\}$

[Ans. A]

53. The appropriate entries for E1, E2, E3 are
- (A) E1: $S \rightarrow aAbB$, $A \rightarrow S$
E2: $S \rightarrow bAaB$, $B \rightarrow S$
E3: $B \rightarrow S$
- (B) E1: $S \rightarrow aAbB$, $S \rightarrow \epsilon$
E2: $S \rightarrow bAaB$, $S \rightarrow \epsilon$
E3: $B \rightarrow \epsilon$
- (C) E1: $S \rightarrow aAbB$, $S \rightarrow \epsilon$
E2: $S \rightarrow bAaB$, $S \rightarrow \epsilon$
E3: $B \rightarrow S$
- (D) E1: $S \rightarrow aAbB$, $S \rightarrow \epsilon$
E2: $S \rightarrow bAaB$, $S \rightarrow \epsilon$
E3: $B \rightarrow \epsilon$

[Ans. C]

Statement for linked Answer Question 54 and 55:

A computer has a 256Kbyte, 4-way set associative, write back data cache with block size of 32 Bytes. The processor sends 32 bit addresses to the cache controller. Each cache tag directory entry contains, in addition to address tag, 2 valid bits, 1 modified bit and 1 replacement bit.

54. The number of bits in the tag field of an address is
- (A) 11 (C) 16
(B) 14 (D) 27

[Ans. C]

55. The size of the cache tag directory is
- | | |
|---------------|--------------|
| (A) 160 Kbits | (C) 40 Kbits |
| (B) 136 Kbits | (D) 32 Kbits |

[Ans. A]

General Aptitude Q.56 – Q.60 carry one mark each.

56. Which one of the following options is the closes in meaning to the word given below?

Mitigate

- | | |
|--------------|--------------|
| (A) Diminish | (C) Dedicate |
| (B) Divulge | (D) Denote |

[Ans. A]

57. Choose the grammatically **INCORRECT** sentence:

- | | |
|---|---|
| (A) They gave us the money back less the service charges of Three Hundred rupees. | (C) The committee initially asked for a funding of Fifty Lakh rupees, but later settled for a lesser sum. |
| (B) This country's expenditure is not less than that of Bangladesh. | (D) This country's expenditure on educational reforms is very less. |

[Ans. D]

58. Choose the most appropriate alternative from the options given below to complete the following sentence:

Despite several _____ the mission succeeded in its attempt to resolve the conflict.

- | | |
|--------------|-----------------|
| (A) Attempts | (C) Meetings |
| (B) Setbacks | (D) Delegations |

[Ans. *]

59. The cost function for a product in a firm is given by $5q^2$, where q is the amount of production. The firm can sell the product at a market price of Rs.50 per unit. The number of units to be produced by the firm such that the profit is maximized is

- | | |
|--------|--------|
| (A) 5 | (C) 15 |
| (B) 10 | (D) 25 |

[Ans. A]

60. Choose the most appropriate alternative from the options given below to complete the following sentence:

Suresh's dog is the one _____ was hurt in the stampede.

- | | |
|-----------|----------|
| (A) That | (C) Who |
| (B) Which | (D) Whom |

[Ans. B]

Q.61 – Q.65 carry two marks each.

61. An automobile plant contracted to buy shock absorbers from two suppliers X and Y. X supplies 60% and Y supplies 40% of the shock absorbers. All shock absorbers are subjected to a quality test. The ones that pass the quality test are considered reliable. Of X's shock absorbers, 96% are reliable. Of Y's shock absorbers, 72% are reliable.

The probability that a randomly chosen shock absorber, which is found to be reliable, is made by Y is

- (A) 0.288 (C) 0.667
(B) 0.334 (D) 0.720

[Ans. B]

62. Which of the following assertions are **CORRECT**?

P: Adding 7 to each entry in a list adds 7 to the mean of the list

Q: Adding 7 to each entry in a list adds 7 to the standard deviation of the list

R: Doubling each entry in a list doubles the mean of the list

S: Doubling each entry in a list leaves the standard deviation of the list unchanged

- (A) P, Q (C) P, R
(B) Q, R (D) R, S

[Ans. C]

63. Given the sequence of terms, AD CG FK JP, the next term is

- (A) OV (C) PV
(B) OW (D) PW

[Ans. A]

64. Wanted Temporary, Part-time persons for the post of Field Interviewer to conduct personal interviews to collect and collate economic data. Requirements: High School-pass, must be available for Day, Evening and Saturday work. Transportation paid, expenses reimbursed.

Which one of the following is the best inference from the above advertisement?

- (A) Gender – discriminatory
(B) Xenophobic
(C) Not designed to make the post attractive
(D) Not gender – discriminatory

[Ans. D]

65. A political party orders an arch for the entrance to the ground in which the annual convention is being held. The profile of the arch follows the equation $y = 2x - 0.1x^2$ where y is the height of the arch in meters. The maximum possible height of the arch is

- (A) 8 meters (C) 12 meters
(B) 10 meters (D) 14 meters.

[Ans. B]