

**PAPER : JULY 2018**

**UGC-NET COMPUTER SCIENCE & APPLICATIONS (87)**

**PAPER-II**

**Note:** This paper contains **fifty(50)** objective type questions for **two (2)** marks each. **All** questions are compulsory. The candidates are required to select the most appropriate answer of each question.

1. The definitions in an XML document are said to be \_\_\_\_\_ when the tagging system and definitions in the DTD are all in compliance.

- (a) well-formed      (b) reasonable      (c) valid      (d) logical

2. Consider the JavaScript Code :

```
var y = "12";
function f() {
    var y = "6";
    alert (this.y);
    function g() {alert (y);}
    g();
}
f();
```

If M is the number of alert dialog boxes generated by this JavaScript code and D<sub>1</sub>, D<sub>2</sub>, ....., D<sub>M</sub> represents the content displayed in each of the M dialog boxes, then :

- (a) M = 3; D<sub>1</sub> displays "12"; D<sub>2</sub> displays "6"; D<sub>3</sub> displays "12".  
(b) M = 3; D<sub>1</sub> displays "6"; D<sub>2</sub> displays "12"; D<sub>3</sub> displays "6".  
(c) M = 2; D<sub>1</sub> displays "6"; D<sub>2</sub> displays "12".  
(d) M = 2; D<sub>1</sub> displays "12"; D<sub>2</sub> displays "6".

3. What is the output of the following JAVA program ?

```
class simple
{
    public static void main(String[] args)
    {
        simple obj = new simple( );
        obj.start( );
    }
    void start( )
    {
        long [ ] P = {3, 4, 5};
        long [ ] Q = method (P);
        System.out.print (P[0] + P[1] + P[2] + ":");
        System.out.print (Q[0] + Q[1] + Q[2]);
    }
    long [ ] method (long [ ] R)
    {
        R[1] = 7;
        return R;
    }
}
// end of class
```

- (a) 12 : 15      (b) 15 : 12      (c) 12 : 12      (d) 15 : 15



4. What is the output of the following 'C' program ? (Assuming little - endian representation of multi-byte data in which Least Significant Byte (LSB) is stored at the lowest memory address).

```
#include <stdio.h>
#include <stdlib.h>
/* Assume short int occupies two bytes of storage */
int main ( )
{
    union saving
    {
        short int one;
        char two [2];
    };
    union saving m;
    m.two [0] = 5;
    m.two [1] = 2;
    printf ("%d, %d, %d\n", m.two [0], m.two [1], m.one);
}/* end of main */
```

- (a) 5, 2, 1282      (b) 5, 2, 52      (c) 5, 2, 25      (d) 5, 2, 517

5. Given below are three implementations of the swap ( ) function in C++ :

(A)	(B)	(C)
<pre>void swap (int a, int b) {     int temp;     temp = a;     a = b;     b = temp; }  int main() {     int p = 0; q = 1;     swap (p, q); }</pre>	<pre>void swap (int &amp;a, int &amp;b) {     int temp;     temp = a;     a = b;     b = temp; }  int main() {     int p = 0, q = 1;     swap (p, q); }</pre>	<pre>void swap (int *a, int *b) {     int *temp;     temp = a;     a = b;     b = temp; }  int main() {     int p = 0, q = 1;     swap (&amp;p, &amp;q); }</pre>

Which of these would actually swap the contents of the two integer variables p and q ?

- (a) (A) only      (b) (B) only      (c) (C) only      (d) (B) and (C) only

6. In Java, which of the following statements is/are TRUE ?

S<sub>1</sub> : The 'final keyword applied to a class definition prevents the class from being extended through derivation.

S<sub>2</sub> : A class can only inherit one class but can implement multiple interfaces.

S<sub>3</sub> : Java permits a class to replace the implementation of a method that it has inherited. It is called method overloading.

Codes :

- (a) S<sub>1</sub> and S<sub>2</sub> only      (b) S<sub>1</sub> and S<sub>3</sub> only      (c) S<sub>2</sub> and S<sub>3</sub> only      (d) All of S<sub>1</sub>, S<sub>2</sub> and S<sub>3</sub>

7. Which of the following statements is/are TRUE ?  
 P : C programming language has weak type system with static types.  
 Q : Java programming language has a strong type system with static types.  
 Codes :  
 (a) P only                      (b) Q only                      (c) Both P and Q                      (d) Neither P nor Q
8. A graphic display system has a frame buffer that is 640 pixels wide, 480 pixels high and 1 bit of color depth. If the access time for each pixel on the average is 200 nanoseconds, then the refresh rate of this frame buffer is approximately.  
 (a) 16 frames per second                      (b) 19 frames per second  
 (c) 21 frames per second                      (d) 23 frames per second
9. Which of the following statements is/are TRUE regarding the solution of the visibility problem in 3D graphics?  
 $S_1$  : The Painter's algorithm sorts polygons by depth and then paints (scan - converts) each Polygon on to the screen starting with the most nearest polygon.  
 $S_2$  : Backface Culling refers to eliminating geometry with backfacing normals.  
 Codes :  
 (a)  $S_1$  only                      (b)  $S_2$  only                      (c) Both  $S_1$  and  $S_2$                       (d) Neither  $S_1$  nor  $S_2$
10. Consider the matrix  $M = \begin{bmatrix} 2 & 0 & 2 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$  representing a set of planar (2D) geometric transformations in homogeneous coordinates. Which of the following statements about the matrix M is True ?  
 (a) M represents first, a scaling of vector (2, 1) followed by translation of vector (1, 1).  
 (b) M represents first, a translation of vector (1, 1) followed by scaling of vector (2, 1).  
 (c) M represents first, a scaling of vector (3, 1) followed by shearing of parameters (-1, 1).  
 (d) M represents first, a shearing of parameters (-1, 1) followed by scaling of vector (3, 1).
11. Assume the following regarding the development of a software system P :  
 • Estimated lines of code of P : 33, 480 LOC.  
 • Average productivity for P : 620 LOC per person-month.  
 • Number of software developers : 6.  
 • Average salary of a software developer : ` 50,000 per month.  
 If E, D and C are the estimated development effort (in person-months), estimated development time (in months), and estimated development cost (in ` Lac) respectively, then (E, D, C) = \_\_\_\_\_.  
 (a) (48, 8, 24)                      (b) (54, 9, 27)                      (c) (60, 10, 30)                      (d) (42, 7, 21)
12. Match the following in Software Engineering :
- |                                                                                                                                                     |                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>List-I</b></p> <p>A. Product Complexity</p> <p>B. Structured System Analysis</p> <p>C. Coupling and Cohesion</p> <p>D. Symbolic Execution</p> | <p><b>List-II</b></p> <p>1. Software Requirements Definition</p> <p>2. Software Design</p> <p>3. Validation Technique</p> <p>4. Software Cost Estimation</p> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
- Codes :
- |     |   |   |   |   |
|-----|---|---|---|---|
|     | A | B | C | D |
| (a) | 2 | 3 | 4 | 1 |
| (b) | 3 | 1 | 4 | 2 |
| (c) | 4 | 1 | 2 | 3 |
| (d) | 3 | 4 | 1 | 2 |



13. Which one of the following is NOT typically provided by Source Code Management Software ?  
 (a) Synchronisation (b) Versioning and Revision history  
 (c) Syntax highlighting (d) Project forking
14. A software system crashed 20 times in the year 2017 and for each crash, it took 2 minutes to restart. Approximately, what was the software availability in that year ?  
 (a) 96.9924 % (b) 97.9924 % (c) 98.9924 % (d) 99.9924 %
15. Match the 5 CMM Maturity levels/CMMI staged representations in List-I with their characterizations in List-II :
- | List-I        |  | List-II                                                         |  |
|---------------|--|-----------------------------------------------------------------|--|
| A. Initial    |  | 1. Processes are improved quantitatively and continually.       |  |
| B. Repeatable |  | 2. The plan for a project comes from a template for plans.      |  |
| C. Defined    |  | 3. The plan uses processes that can be measured quantitatively. |  |
| D. Managed    |  | 4. There may not exist a plan or it may be abandoned.           |  |
| E. Optimizing |  | 5. There's a plan and people stick to it.                       |  |
- Codes :
- |     | A | B | C | D | E |
|-----|---|---|---|---|---|
| (a) | 4 | 5 | 1 | 3 | 2 |
| (b) | 1 | 2 | 4 | 5 | 3 |
| (c) | 5 | 4 | 2 | 3 | 1 |
| (d) | 4 | 5 | 2 | 3 | 1 |
16. Coupling is a measure of the strength of the interconnections between software modules. Which of the following are correct statements with respect to module coupling ?  
 P : Common coupling occurs when one module controls the flow of another module by passing it information on what to do.  
 Q : In data coupling, the complete data structure is passed from one module to another through parameters.  
 R : Stamp coupling occurs when modules share a composite data structure and use only parts of it.  
 Codes :  
 (a) P and Q only (b) P and R only (c) Q and R only (d) All of P, Q and R
17. A software design pattern often used to restrict access to an object is :  
 (a) Adapter (b) Decorator (c) Delegation (d) Proxy
18. Reasons to re-engineer a software include :  
 P : Allow legacy software to quickly adapt to the changing requirements.  
 Q : Upgrade to newer technologies / platforms / paradigm (for example, object-oriented).  
 R : Improve software maintainability.  
 S : Allow change in the functionality and architecture of the software.  
 Code :  
 (a) P, R and S only (b) P and R only (c) P, Q and S only (d) P, Q and R only
19. Which of the following is not a key strategy followed by the clean room approach to software development ?  
 (a) Formal specification (b) Dynamic verification  
 (c) Incremental development (d) Statistical testing of the system
20. Which of the following statements is/are True ?  
 P : Refactoring is the process of changing a software system in such a way that it does not alter the external behavior of the code yet improves the internal architecture.

Q : An example of refactoring is adding new features to satisfy a customer requirement discovered after a project is shipped.

Code :

- (a) P only                      (b) Q only                      (c) Both P and Q                      (d) Neither P nor Q

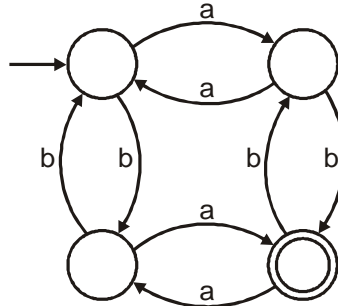
21. The solution of the recurrence relation  $T(m) = T(3m/4) + 1$  is :  
 (a)  $\theta(\log m)$                       (b)  $\theta(m)$                       (c)  $\theta(m \log m)$                       (d)  $\theta(\log \log m)$
22. Consider the array  $A = \langle 4, 1, 3, 2, 16, 9, 10, 14, 8, 7 \rangle$ . After building heap from the array A, the depth of the heap and the right child of max-heap are \_\_\_\_\_ and \_\_\_\_\_.  
 (a) 3, 14                      (b) 3, 10                      (c) 4, 14                      (d) 4, 10
23. A hash function h defined  $h(\text{key}) = \text{key} \bmod 7$ , with linear probing, is used to insert the keys 44, 45, 79, 55, 91, 18, 63 into a table indexed from 0 to 6. What will be the location of key 18 ?  
 (a) 3                      (b) 4                      (c) 5                      (d) 6
24. Which of the following algorithms solves the single-source shortest paths ?  
 (a) Prim's algorithm                      (b) Floyd - Warshall algorithm  
 (c) Johnson's algorithm                      (d) Dijkstra's algorithm
25. A text is made up of the characters A, B, C, D, E each occurring with the probability 0.08, 0.40, 0.25, 0.15 and 0.12 respectively. The optimal coding technique will have the average length of :  
 (a) 2.4                      (b) 1.87                      (c) 3.0                      (d) 2.15
26. A binary search tree in which every non-leaf node-empty left and right subtrees is called a strictly binary tree. Such a tree with 19 leaves.  
 (a) cannot have more than 37 nodes                      (b) has exactly 37 nodes  
 (c) has exactly 35 nodes                      (d) cannot have more than 35 nodes
27. Match the following with respect to algorithm paradigms :  

List-I	List-II
A. The 8-Queen's problem	1. Dynamic programming
B. Single-Source shortest paths	2. Divide and conquer
C. Strassen's matrix multiplication	3. Greedy approach
D. Optimal binary search trees	4. Backtracking
- Codes :  

	A	B	C	D
(a)	4	1	3	2
(b)	4	3	1	2
(c)	3	4	2	1
(d)	4	3	2	1
28. The maximum number of comparisons needed to sort 9 times using radix sort is (Assume each item is 5 digit octal number) :  
 (a) 45                      (b) 72                      (c) 360                      (d) 450
29. A 5-ary tree is tree in which every internal node has exactly 5 children. The number of leaf nodes in such a tree with 8 internal nodes will be :  
 (a) 30                      (b) 33                      (c) 45                      (d) 125
30. Consider a Boolean function of 'n' variables. The order of an algorithm that determines whether the Boolean function produces a output 1 is :  
 (a) Logarithmic                      (b) Linear                      (c) Quadratic                      (d) Exponential

31. Two finite state machines are said to be equivalent if they :
- (a) Have the same number of edges.                      (b) Have the same number of states.  
 (c) Recognize the same set of tokens.                      (d) Have the same number of states and edges.

32. The finite state machine given in figure below recognizes :



- (a) any strings of odd number of a's  
 (b) any string of odd number of b's  
 (c) any strings of even number of a's and odd number of b's  
 (d) any strings of odd number of a's and odd number of b's
33. A pushdown automata behaves like a Turing machine when the number of auxiliary memory is :  
 (a) 0                      (b) 1                      (c) 1 or more                      (d) 2 or more
34. Pushdown automata can recognize language generated by \_\_\_\_\_ .  
 (a) Only context free grammar  
 (b) Only regular grammar  
 (c) Context free grammar or regular grammar  
 (d) Only context sensitive grammar
35. To obtain a string of n Terminals from a given Chomsky normal form grammar, the number of productions to be used is :  
 (a)  $2n - 1$                       (b)  $2n$                       (c)  $n + 1$                       (d)  $n^2$
36. Consider the following two Grammars :  
 $G_1 : S \rightarrow SbS \mid a$   
 $G_2 : S \rightarrow aB \mid ab, A \rightarrow GAB \mid a, B \rightarrow ABb \mid b$   
 Which of the following option is **correct** ?  
 (a) Only  $G_1$  is ambiguous                      (b) Only  $G_2$  is ambiguous  
 (c) Both  $G_1$  and  $G_2$  are ambiguous                      (d) Both  $G_1$  and  $G_2$  are not ambiguous
37. Context sensitive language can be recognized by a :  
 (a) Finite state machine  
 (b) Deterministic finite automata  
 (c) Non-deterministic finite automata  
 (d) Linear bounded automata
38. The set  $A = \{0^n 1^n 2^n \mid n = 1, 2, 3, \dots\}$  is an example of a grammar that is :  
 (a) Context sensitive                      (b) Context free                      (c) Regular                      (d) None of these
39. A bottom-up parser generates :  
 (a) Left-most derivation in reverse                      (b) Right-most derivation in reverse  
 (c) Left-most derivation                      (d) Right-most derivation

40. Consider the following statements( ) :  
 $S_1$  : There exists no algorithm for deciding if any two Turing machines  $M_1$  and  $M_2$  accept the same language.  
 $S_2$  : The problem of determining whether a Turing machine halts on any input is undecidable.  
 Which of the following options is correct ?  
 (a) Both  $S_1$  and  $S_2$  are correct (b) Both  $S_1$  and  $S_2$  are not correct  
 (c) Only  $S_1$  is correct (d) Only  $S_2$  is correct
41. A slotted ALOHA network transmits 200-bit frames using a shared channel with a 200 Kbps bandwidth. Find the throughput of the system, if the system (all stations put together) produces 250 frames per second.  
 (a) 49 (b) 368 (c) 149 (d) 151
42. The period of a signal is 100 ms. Its frequency is \_\_\_\_\_.  
 (a)  $100^3$  Hertz (b)  $10^{-2}$  KHz (c)  $10^{-3}$  KHz (d)  $10^5$  Hertz
43. The dotted-decimal notation of the following IPV4 address in binary notation is \_\_\_\_\_.  
 10000001 00001011 00001011 11101111  
 (a) 111.56.45.239 (b) 129.11.10.238 (c) 129.11.11.239 (d) 111.56.11.239
44. Which of the following statements are True ?  
 (1) Advanced Mobile Phone System (AMPS) is a second generation cellular phone system.  
 (2) IS - 95 is a second generation cellular phone system based on CDMA and DSSS.  
 (3) The third generation cellular phone system will provide universal personnel communication.  
 Codes :  
 (a) (1) and (2) only (b) (2) and (3) only (c) (1), (2) and (3) (d) (1) and (3) only
45. Match the following symmetric block ciphers with corresponding block and key sizes :  

<b>List-I</b> A. DES B. IDEA C. BLOW FISH D. AES	<b>List-II</b> 1. Block size 64 and key size ranges between 32 and 448. 2. Block size 64 and key size 64. 3. Block size 128 and key sizes 128, 192, 256. 4. Block size 64 and key size 128.
--------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

 Codes :  

	A	B	C	D
(a)	4	2	1	3
(b)	2	4	1	3
(c)	2	4	3	1
(d)	4	2	3	1
46. Which of the following statements are True ?  
 (A) Three broad categories of Networks are  
 (i) Circuit Switched Networks  
 (ii) Packet Switched Networks  
 (iii) Message Switched Networks  
 (B) Circuit Switched Network resources need to be reversed during the set up phase.  
 (C) In packet switching there is no resource allocation for packets.  
 Codes :  
 (a) (A) and (B) only (b) (B) and (C) only (c) (A) and (C) only (d) (A), (B) and (C)



47. In Challenge-Response authentication the claimant \_\_\_\_\_.
- Proves that she knows the secret without revealing it.
  - Proves that she doesn't know the secret.
  - Reveals the secret.
  - Gives a challenge.
48. Decrypt the message "WTAAD" using the Caesar Cipher with key = 15.
- LIPPS
  - HELLO
  - OLLEH
  - DAATW
49. To guarantee correction of upto  $t$  errors, the minimum Hamming distance  $d_{\min}$  in a block code must be \_\_\_\_\_.
- $t + 1$
  - $t - 2$
  - $2t - 1$
  - $2t + 1$
50. Encrypt the Message "HELLO MY DEARZ" using Transposition Cipher with
- |     |   |             |      |
|-----|---|-------------|------|
| Key | { | Plain Text  | 2413 |
|     |   | Cipher Text | 1234 |
- HLLEO YM AEDRZ
  - EHOLL ZYM RAED
  - ELHL MDOY AZER
  - ELHL DOMY ZAER
51. At a particular time of computation, the value of a counting semaphore is 10. Then 12 P operations and "x" V operations were performed on this semaphore. If the final value of semaphore is 7,  $x$  will be
- 8
  - 9
  - 10
  - 11
52. In a paged memory, the page hit ratio is 0.40. The time required to access a page in secondary memory is equal to 120 ns. The time required to access a page in primary memory is 15 ns. The average time required to access a page is \_\_\_\_\_.
- 105
  - 68
  - 75
  - 78
53. In a multi-user operating system, 30 requests are made to use a particular resource per hour, on an average. The probability that no requests are made in 40 minutes, when arrival pattern is a poisson distribution, is :
- $e^{-15}$
  - $1 - e^{-15}$
  - $1 - e^{-20}$
  - $e^{-20}$
54. Normally user programs are prevented from handling I/O directly by I/O instructions in them. For CPUs having explicit I/O instructions, such I/O protection is ensured by having the I/O instructions privileged. In a CPU with memory mapped I/O, there is no-explicit I/O instruction. Which one of the following is true for a CPU with memory mapped I/O ?
- I/O protection is ensured by operating system routines.
  - I/O protection is ensured by a hardware trap.
  - I/O protection is ensured during system configuration.
  - I/O protection is not possible.
55. Which UNIX/Linux command is used to make all files and sub-directories in the directory "progs" executable by all users ?
- `chmod -R a + x progs`
  - `chmod -R 222 progs`
  - `chmod -X a + x progs`
  - `chmod -X 222 progs`
56. Which of the following statements are True ?
- External Fragmentation exists when there is enough total memory space to satisfy a request but the available space is contiguous.
  - Memory Fragmentation can be internal as well as external.
  - One solution to external Fragmentation is compaction.
- Code :
- (1) and (2) only
  - (1) and (3) only
  - (2) and (3) only
  - (1), (2) and (3)



57. Page information in memory is also called as Page Table. The essential contents in each entry of a page table is/are \_\_\_\_\_ .  
 (a) Page access information (b) Virtual page number  
 (c) Page frame number (d) Both virtual page number and page frame number
58. Consider a virtual page reference string 1, 2, 3, 2, 4, 2, 5, 2, 3, 4. Suppose LRU page replacement algorithm is implemented with 3 page frames in main memory. Then the number of page faults are \_\_\_\_\_ .  
 (a) 5 (b) 7 (c) 9 (d) 10

59. Consider the following three processes with the arrival time and CPU burst time given in milliseconds :

Process	Arrival Time	Burst Time
P <sub>1</sub>	0	7
P <sub>2</sub>	1	4
P <sub>3</sub>	2	8

The Gantt chart for preemptive SJF scheduling algorithm is \_\_\_\_\_ .

- (a) 

	P <sub>1</sub>		P <sub>2</sub>		P <sub>3</sub>	
0	7	13	21			

 (b) 

	P <sub>1</sub>		P <sub>2</sub>		P <sub>1</sub>		P <sub>3</sub>	
0	1	5	11	19				
- (c) 

	P <sub>1</sub>		P <sub>2</sub>		P <sub>3</sub>	
0	7	11	19			

 (d) 

	P <sub>2</sub>		P <sub>3</sub>		P <sub>1</sub>	
0	4	12	19			

60. In which of the following scheduling criteria, context switching will never take place ?  
 (a) Round Robin (b) Preemptive SJF  
 (c) Non-preemptive SJF (d) Preemptive priority
61. In RDBMS, which type of Join returns all rows that satisfy the join condition ?  
 (a) Inner join (b) Outer join (c) Semi join (d) Anti join
62. Consider a relation book (title, price) which contains the titles and prices of different books. Assuming that no two books have the same price, what does the following SQL query list ?

```

Select title
from book as B
where (select count (*)
      from book as T
      where T.price > B.price) < 7
    
```

- (a) Titles of the six most expensive books.  
 (b) Title of the sixth most expensive books.  
 (c) Titles of the seven most expensive books.  
 (d) Title of the seventh most expensive books.
63. In a Hierarchical database, a hashing function is used to locate the \_\_\_\_\_.  
 (a) Collision (b) Root (c) Foreign key (d) Records
64. Relations produced from E-R Model will always be in \_\_\_\_\_.  
 (a) 1 NF (b) 2 NF (c) 3 NF (d) 4 NF
65. Consider the following schedules involving two transactions.  
 S<sub>1</sub> : r<sub>1</sub>(X); r<sub>1</sub>(Y); r<sub>2</sub>(X); r<sub>2</sub>(Y); w<sub>2</sub>(Y); w<sub>1</sub>(X)  
 S<sub>2</sub> : r<sub>1</sub>(X); r<sub>2</sub>(X); r<sub>2</sub>(Y); w<sub>2</sub>(Y); r<sub>1</sub>(Y); w<sub>1</sub>(X)  
 Which one of the following statements is correct with respect to above ?  
 (a) Both S<sub>1</sub> and S<sub>2</sub> are conflict serializable.  
 (b) Both S<sub>1</sub> and S<sub>2</sub> are not conflict serializable.  
 (c) S<sub>1</sub> is conflict serializable and S<sub>2</sub> is not conflict serializable.  
 (d) S<sub>1</sub> is not conflict serializable and S<sub>2</sub> is conflict serializable.



66. For a database relation  $R(a, b, c, d)$  where the domains of  $a, b, c$  and  $d$  include only atomic values, and only the following functional dependencies and those that can be inferred from them hold :
- $a \rightarrow c$   
 $b \rightarrow d$   
The relation is in \_\_\_\_\_.
- (a) First normal form but not in second normal form.
  - (b) Second normal form but not in third normal form.
  - (c) Third normal form.
  - (d) BCNF
67. A many-to-one relationship exists between entity sets  $r_1$  and  $r_2$ . How will it be represented using functional dependencies if  $Pk(r)$  denotes the primary key attribute of relation ?
- (a)  $Pk(r_1) \rightarrow Pk(r_2)$                       (b)  $Pk(r_2) \rightarrow Pk(r_1)$
  - (c)  $Pk(r_2) \rightarrow Pk(r_1)$  and  $Pk(r_1) \rightarrow Pk(r_2)$       (d)  $Pk(r_2) \rightarrow Pk(r_1)$  or  $Pk(r_1) \rightarrow Pk(r_2)$
68. Database system that store each relation in a separate operating system file may use the operating system's authorization scheme, instead of defining a special scheme themselves. In this case, which of the following is false?
- (a) The administrator enjoys more control on the grant option.
  - (b) It is difficult to differentiate among the update, delete and insert authorizations.
  - (c) Cannot store more than one relation in a file.
  - (d) Operations on the database are speeded up as the authorization procedure is carried out at the operating system level.
69. Let  $R_1(a, b, c)$  and  $R_2(x, y, z)$  be two relations in which  $a$  is the foreign key of  $R_1$  that refers to the primary key of  $R_2$ . Consider following four options.  
(1) Insert into  $R_1$       (2) Insert into  $R_2$       (3) Delete from  $R_1$       (4) Delete from  $R_2$   
Which of the following is correct about the referential integrity constraint with respect to above ?
- (a) Operations (1) and (2) will cause violation.
  - (b) Operations (2) and (3) will cause violation.
  - (c) Operations (3) and (4) will cause violation.
  - (d) Operations (4) and (1) will cause violation.
70. Consider a hash table of size seven, with starting index zero, and a hash function  $(7x + 3) \bmod 4$ . Assuming the has table is initially empty, which of the following is the contents of the table when the sequence 1, 3, 8, 10 is inserted into the table using closed hashing ? Here "\_\_\_\_\_" denotes an empty location in the table.
- (a) 3, 10, 1, 8, \_\_\_\_, \_\_\_\_, \_\_\_\_                      (b) 1, 3, 8, 10, \_\_\_\_, \_\_\_\_, \_\_\_\_
  - (c) 1, \_\_\_\_, 3, \_\_\_\_, 8, \_\_\_\_, 10                      (d) 3, 10, \_\_\_\_, \_\_\_\_, 8, \_\_\_\_, \_\_\_\_
71. In Artificial Intelligence (AI), an environment is uncertain if it is
- (a) Not fully observable and not deterministic
  - (b) Not fully observable but not deterministic
  - (c) Fully observable but not deterministic
  - (d) Not fully observable but deterministic
72. In Artificial Intelligence (AI), a simple reflex agent selects actions on the basis of \_\_\_\_\_.
- (a) current percept, completely ignoring rest of the percept history.
  - (b) rest of the percept history, completely ignoring current percept.
  - (c) both current percept and complete percept history.
  - (d) both current percept and just previous percept.

73. In heuristic search algorithms in Artificial Intelligence (AI), if a collection of admissible heuristics  $h_1, \dots, h_m$  is available for a problem and none of them dominates any of the others, which should we choose ?
- (a)  $h(n) = \max \{h_1(n), \dots, h_m(n)\}$                       (b)  $h(n) = \min \{h_1(n), \dots, h_m(n)\}$   
(c)  $h(n) = \text{avg} \{h_1(n), \dots, h_m(n)\}$                       (d)  $h(n) = \text{sum} \{h_1(n), \dots, h_m(n)\}$
74. Consider following sentences regarding  $A^*$ , an informed search strategy in Artificial Intelligence (AI).  
(1)  $A^*$  expands all nodes with  $f(n) < C^*$ .  
(2)  $A^*$  expands no nodes with  $f(n) \geq C^*$ .  
(3) Pruning is integral to  $A^*$ .  
Here,  $C^*$  is the cost of the optimal solution path.  
Which of the following is correct with respect to the above statements ?  
(a) Both statement (1) and statement (2) are true.  
(b) Both statement (1) and statement (3) are true.  
(c) Both statement (2) and statement (3) are true.  
(d) All the statements (1), (2) and (3) are true.
75. Consider a vocabulary with only four propositions A, B, C and D. How many models are there for the following sentence.
- $B \vee C$
- (a) 10                      (b) 12                      (c) 15                      (d) 16
76. Consider the following statements :  
(1)  $\text{False} \models \text{True}$   
(2) If  $\alpha \models (\beta \wedge \gamma)$  then  $\alpha \models \beta$  and  $\alpha \models \gamma$   
Which of the following is correct with respect to the above statements ?  
(a) Both statement (1) and statement (2) are false.  
(b) Statement (1) is true but statement (2) is false.  
(c) Statement (1) is false but statement (2) is true.  
(d) Both statement (1) and statement (2) are true.
77. Consider the following English sentence :  
“Agra and Gwalior are both in India”.  
A student has written a logical sentence for the above English sentence in First-Order Logic using predicate. In  $(x, y)$ , which means  $x$  is in  $y$ , as follows :  
 $\text{In}(\text{Agra}, \text{India}) \vee \text{In}(\text{Gwalior}, \text{India})$   
Which one of the following is correct with respect to the above logical sentence ?  
(a) It is syntactically valid but does not express the meaning of the English sentence.  
(b) It is syntactically valid and expresses the meaning of the English sentence also.  
(c) It is syntactically invalid but expresses the meaning of the English sentence.  
(d) It is syntactically invalid and does not express the meaning of the English sentence.
78. Consider the following two sentences :  
(1) The planning graph data structure can be used to give a better heuristic for a planning problem.  
(2) Dropping negative effects from every action schema in a planning problem results in a relaxed problem.  
Which of the following is correct with respect to the above sentences ?  
(a) Both sentence (1) and sentence (2) are false.  
(b) Both sentence (1) and sentence (2) are true.  
(c) Sentence (1) is true but sentence (2) is false.  
(d) Sentence (1) is false but sentence (2) is true.



79. A knowledge base contains just one sentence,  $\exists x \text{AsHighAs}(x, \text{Everest})$ . Consider the following two sentences obtained after applying existential instantiation.
- (1)  $\text{AsHighAs}(\text{Everest}, \text{Everest})$   
 (2)  $\text{AsHighAs}(\text{Kilimanjaro}, \text{Everest})$
- Which of the following is correct with respect to the above sentences ?
- (a) Both sentence (1) and sentence (2) are sound conclusions.  
 (b) Both sentence (1) and sentence (2) are unsound conclusions.  
 (c) Sentence (1) is sound but sentence (2) is unsound.  
 (d) Sentence (1) is unsound but sentence (2) is sound.
80. Consider the set of all possible five-card poker hands dealt fairly from a standard deck of fifty-two cards. How many atomic events are there in the joint probability distribution ?
- (a) 2, 598, 960      (b) 3, 468, 960      (c) 3, 958, 590      (d) 2, 645, 590
81.  $E$  is the number of edges in the graph and  $f$  is maximum flow in the graph. When the capacities are integers, the runtime of Ford-Fulberson algorithm is bounded by :
- (a)  $O(E * f)$       (b)  $O(E^2 * f)$       (c)  $O(E * f^2)$       (d)  $O(E^2 * f^2)$
82. Which of the following statements is false about convex minimization problem ?
- (a) If a local minimum exists, then it is a global minimum.  
 (b) The set of all global minima is convex set.  
 (c) The set of all global minima is concave set.  
 (d) For each strictly convex function, if the function has a minimum, then the minimum is unique.
83. The following LPP
- Maximize  $z = 100x_1 + 2x_2 + 5x_3$   
 Subject to
- $14x_1 + x_2 - 6x_3 + 3x_4 = 7$   
 $32x_1 + x_2 - 12x_3 \leq 10$   
 $3x_1 - x_2 - x_3 \leq 0$   
 $x_1, x_2, x_3, x_4 \geq 0$
- has
- (a) Solution :  $x_1 = 100, x_2 = 0, x_3 = 0$       (b) Unbounded solution  
 (c) No solution      (d) Solution :  $x_1 = 50, x_2 = 70, x_3 = 60$
84. Digital data received from a sensor can fill up to 32 buffers. Let the sample space be  $S = \{0, 1, 2, \dots, 32\}$  where the sample  $j$  denote that  $j$  of the buffers are full and  $p(i) = \frac{1}{561}(33-i)$ . Let  $A$  denote the event that the even number of buffers are full. Then  $p(A)$  is :
- (a) 0.515      (b) 0.785      (c) 0.758      (d) 0.485
85. The equivalence of  $\exists x Q(x)$  is:
- (a)  $\exists x \neg Q(x)$       (b)  $\forall x \neg Q(x)$       (c)  $\neg \exists x \neg Q(x)$       (d)  $\forall x Q(x)$
86. If  $A_i = \{-1, \dots, -2, -1, 0, 1, 2, \dots, i\}$ , then  $\bigcup_{i=1}^{\infty} A_i$  is :
- (a)  $Z$       (b)  $Q$       (c)  $R$       (d)  $C$

87. Match the following in List-I and List-II, for a function  $f$  :

**List-I**

- A.  $\forall x \forall y (f(x) = f(y) \rightarrow x = y)$
- B.  $\forall y \exists x (f(x) = y)$
- C.  $\forall x f(x) = k$

**List-II**

- 1. Constant
- 2. Injective
- 3. Surjective

**Codes :**

- |     | A | B | C |
|-----|---|---|---|
| (a) | 1 | 2 | 3 |
| (b) | 3 | 2 | 1 |
| (c) | 2 | 1 | 3 |
| (d) | 2 | 3 | 1 |

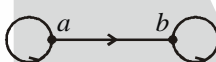
88. Which of the relations on  $\{0, 1, 2, 3\}$  is an equivalence relation ?

- (a)  $\{(0, 0) (0, 2) (2, 0) (2, 2) (2, 3) (3, 2) (3, 3)\}$
- (b)  $\{(0, 0) (1, 1) (2, 2) (3, 3)\}$
- (c)  $\{(0, 0) (0, 1) (0, 2) (1, 0) (1, 1) (1, 2) (2, 0)\}$
- (d)  $\{(0, 0) (0, 2) (2, 3) (1, 1) (2, 2)\}$

89. Which of the following is an equivalence relation on the set of all functions from  $Z$  to  $Z$  ?

- (a)  $\{(f, g) \mid f(x) - g(x) = 1 \forall x \in Z\}$
- (b)  $\{(f, g) \mid f(0) = g(0) \text{ or } f(1) = g(1)\}$
- (c)  $\{(f, g) \mid f(0) = g(1) \text{ and } f(1) = g(0)\}$
- (d)  $\{(f, g) \mid f(x) - g(x) = k \text{ for some } k \in Z\}$

90. Which of the following statements is true ?

- (a)  $(Z, \leq)$  is not totally ordered
- (b) The set inclusion relation  $\subseteq$  is a partial ordering on the power set of a set  $S$
- (c)  $(Z, \neq)$  is a poset
- (d) The directed graph  is not a partial order

91. CMOS is a Computer Chip on the motherboard, which is :

- (a) RAM
- (b) ROM
- (c) EPROM
- (d) Auxillary storage

92. In RS flip-flop, the output of the flip-flop at time  $(t + 1)$  is same as the output at time  $t$ , after the occurrence of a clock pulse if :

- (a)  $S = R = 1$
- (b)  $S = 0, R = 1$
- (c)  $S = 1, R = 0$
- (d)  $S = R = 0$

93. Match the terms in List-I with the options given in List-II

**List-I**

- A. Decoder
- B. Multiplexer
- C. Demultiplexer

**List-II**

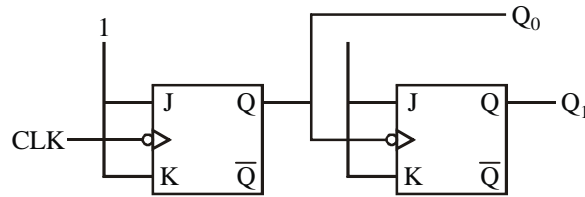
- 1. 1 line to  $2^n$  lines
- 2.  $n$  lines to  $2^n$  lines
- 3.  $2^n$  lines to 1 line
- 4.  $2^n$  lines to  $2^{n-1}$  lines

**Codes :**

- |     | A | B | C |
|-----|---|---|---|
| (a) | 2 | 1 | 3 |
| (b) | 2 | 3 | 1 |
| (c) | 2 | 1 | 4 |
| (d) | 4 | 2 | 1 |



94. What does the following logic diagram represent ?



- (a) Synchronous Counter (b) Ripple Counter  
 (c) Combinational Circuit (d) Mod 2 Counter
95. The hexadecimal equivalent of the binary integer number 110101101 is :  
 (a) D 24 (b) 1 BD (c) 1 AE (d) 1 AD
96. Perform the following operation for the binary equivalent of the decimal numbers  $(-14)_{10} + (-15)_{10}$  :  
 The solution in 8 bit representation is :  
 (a) 11100011 (b) 00011101 (c) 10011101 (d) 11110011
97. Match the items in List-I and List-II :

	List - I		List - II
A.	Interrupts which can be delayed when a much highest priority interrupt has occurred	1.	Normal
B.	Unplanned interrupts which occur while executing a program	2.	Synchronous
C.	Source of interrupt is in phase with the system clock	3.	Maskable
		4.	Exception

Codes :

- |     |   |   |   |
|-----|---|---|---|
|     | A | B | C |
| (a) | 2 | 1 | 4 |
| (b) | 2 | 4 | 3 |
| (c) | 3 | 1 | 2 |
| (d) | 3 | 4 | 2 |

98. Which of the following mapping is not used for mapping process in cache memory ?  
 (a) Associative mapping (b) Direct mapping  
 (c) Set-associative mapping (d) Segmented-page mapping
99. Simplify the following using K-map :  
 $F(A, B, C, D) = \Sigma(0, 1, 2, 8, 9, 12, 13)$   
 $d(A, B, C, D) = \Sigma(10, 11, 14, 15)$   
 d stands for don't care condition.  
 (a)  $A + \bar{B}\bar{D} + BC$  (b)  $A + \bar{B}\bar{D} + \bar{B}C$  (c)  $\bar{A} + \bar{B}\bar{C}$  (d)  $\bar{A} + \bar{B}\bar{C} + \bar{B}\bar{D}$
100. In 8085 microprocessor, what is the output of following program ?  
 LDA 8000 H  
 MVI B, 30 H  
 ADD B  
 STA 8001 H  
 (a) Read a number from input port and store it in memory.  
 (b) Read a number from input device with address 8000H and store it in memory at location 8001H  
 (c) Read a number from memory at location 8000H and store it in memory location 8001H  
 (d) Load A with data from input device with address 8000H and display it on the output device with address 8001H