

**PAPER : JUNE 2015**

**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. How many strings of 5 digits have the property that the sum of their digits is 7 ?  
(a) 66                      (b) 330                      (c) 495                      (d) 99
2. Consider an experiment of tossing two fair dice, one black and one red. What is the probability that the number on the black die divides the number on red die ?  
(a)  $\frac{22}{36}$                       (b)  $\frac{12}{36}$                       (c)  $\frac{14}{36}$                       (d)  $\frac{6}{36}$
3. In how many ways can 15 indistinguishable fish be placed into 5 different ponds, so that each pond contains atleast one fish ?  
(a) 1001                      (b) 3876                      (c) 775                      (d) 200
4. Consider the following statements:  
(1) Depth-first search is used to traverse a rooted tree.  
(2) Pre-order, Post-order and Inorder are used to list the vertices of an ordered rooted tree.  
(3) Huffman's algorithm is used to find an optimal binary tree with given weights.  
(4) Topological sorting provides a labelling such that the parents have larger labels than their children.  
Which of the above statement are true ?  
(a) (1) and (2)                      (b) (3) and (4)                      (c) (1), (2) and (3)                      (d) (1), (2), (3) and (4)
5. Consider a Hamiltonian Graph (G) with no loops and parallel edges. Which of the following is true with respect to this Graph (G) ?  
(1)  $\deg(v) \geq \frac{n}{2}$  for each vertex of G  
(2)  $|E(G)| \geq \frac{1}{2}(n-1)(n-2) + 2$  edges  
(3)  $\deg(v) + \deg(w) \geq n$  for every  $v$  and  $w$  not connected by an edge  
(a) (1) and (2)                      (b) (2) and (3)                      (c) (1) and (3)                      (d) (1), (2) and (3)
6. Consider the following statements :  
(1) Boolean expressions and logic networks corresponds to labelled a cyclic diagraphs.  
(2) Optimal boolean expressions may not corresponds to simplest networks.  
(3) Choosing essential blocks first in a Karnaugh map and then greedily choosing the largest remaining blocks to cover may not give an optimal expression.  
Which of these statement(s) is/are correct ?  
(a) (1) only                      (b) (2) only                      (c) (1) and (2)                      (d) (1), (2) and (3)
7. Consider a full-adder with the following input values :  
(1)  $x = 1, y = 0$  and  $C_i$  (carry input) = 0  
(2)  $x = 0, y = 1$  and  $C_i = 1$   
Compute the values of S(sum) and  $C_o$  (carry output) for the above input values.  
(a)  $S = 1, C_o = 0$  and  $S = 0, C_o = 1$                       (b)  $S = 0, C_o = 0$  and  $S = 1, C_o = 1$   
(c)  $S = 1, C_o = 1$  and  $S = 0, C_o = 0$                       (d)  $S = 0, C_o = 1$  and  $S = 1, C_o = 0$



8. “If my computations are correct and I pay the electric bill, then I will run out of money. If I don’t pay the electric bill, the power will be turned off. Therefore, if I don’t run out of money and the power is still on, then my computations are incorrect.”

Convert this argument into logical notations using the variables  $c$ ,  $b$ ,  $r$ ,  $p$  for propositions of computations, electric bills, out of money and the power respectively. (Where  $\neg$  means NOT)

- (a) if  $(c \wedge b) \rightarrow r$  and  $\neg b \rightarrow \neg p$ , then  $(\neg r \wedge p) \rightarrow \neg c$   
 (b) if  $(c \vee b) \rightarrow r$  and  $\neg b \rightarrow \neg p$ , then  $(r \wedge p) \rightarrow c$   
 (c) if  $(c \wedge b) \rightarrow r$  and  $\neg p \rightarrow \neg b$ , then  $(\neg r \vee p) \rightarrow \neg c$   
 (d) if  $(c \vee b) \rightarrow r$  and  $\neg b \rightarrow \neg p$ , then  $(\neg r \wedge p) \rightarrow \neg c$

9. Match the following :

**List – I**

- A.  $(p \rightarrow q) \Leftrightarrow (\neg q \rightarrow \neg p)$   
 B.  $[(p \wedge q) \rightarrow r] \Leftrightarrow [p \rightarrow (q \rightarrow r)]$   
 C.  $(p \rightarrow q) \Leftrightarrow [(p \wedge \neg q) \rightarrow o]$   
 D.  $(p \leftrightarrow q) \Leftrightarrow [p \rightarrow q] \wedge [q \rightarrow p]$

**List – II**

- i. Contrapositive  
 ii. Exportation law  
 iii. Reductio and absurdum  
 iv. Equivalence

**Codes :**

- |     | <b>A</b> | <b>B</b> | <b>C</b> | <b>D</b> |
|-----|----------|----------|----------|----------|
| (a) | i        | ii       | iii      | iv       |
| (b) | ii       | iii      | i        | iv       |
| (c) | iii      | ii       | iv       | i        |
| (d) | iv       | ii       | iii      | i        |

10. Consider a proposition given as :

“ $x \geq 6$ , if  $x^2 \geq 25$  and its proof as :

If  $x \geq 6$ , then  $x^2 = x \cdot x \geq 6 \cdot 6 = 36 \geq 25$

Which of the following is correct w.r.to the given proposition and its proof ?

- (1) The proof shows the converse of what is to be proved.  
 (2) The proof starts by assuming what is to be shown.  
 (3) The proof is correct and there is nothing wrong.  
 (a) (1) only                      (b) (3) only                      (c) (1) and (2)                      (d) (2) only

11. What is the output of the following program ?

(Assume that the appropriate preprocessor directives are included and there is no syntax error)  
 main ( )

```
{ char S[ ] = "ABCDEFGH";
  printf ("%C", * (& S[3]));
  printf ("%s", S + 4);
  printf ("%u", S);
  /* Base address of S is 1000 */
}
```

- (a) ABCDEFGH1000 (b) CDEFGH1000 (c) DDEFGHH1000 (d) DEFGH1000

12. Which of the following, in C++, is inherited in a derived class from base class ?

- (a) constructor                      (b) destructor                      (c) data members                      (d) virtual methods

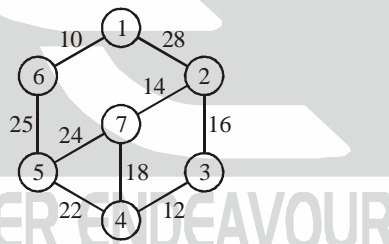
13. Given that  $x = 7.5$ ,  $j = -1.0$ ,  $n = 1.0$ ,  $m = 2.0$  the value of  $--x + j = x > n >= m$  is :

- (a) 0                      (b) 1                      (c) 2                      (d) 3

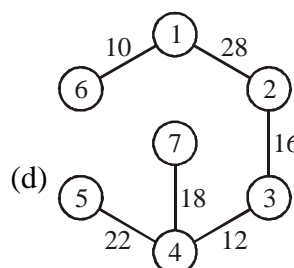
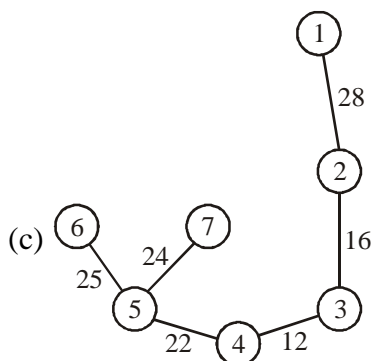
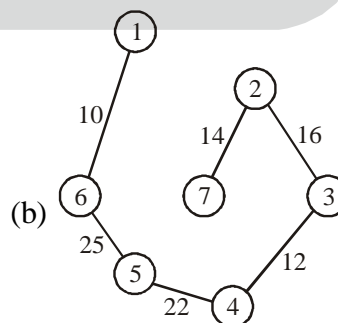
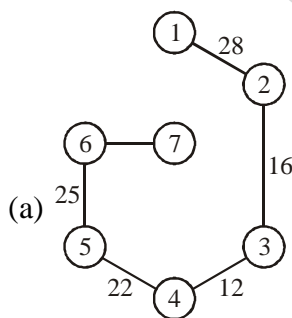
14. Which of the following is incorrect in C++ ?

- (a) When we write overloaded function we must code the function for each usage.  
 (b) When we write function template we code the function only once.  
 (c) It is difficult to debug macros  
 (d) Templates are more efficient than macros

15. When the inheritance is private, the private methods in base class are \_\_\_\_\_ in the derived class (in C++).  
 (a) inaccessible      (b) accessible      (c) protected      (d) public
16. An Assertion is a predicate expressing a condition we wish database to always satisfy. The correct syntax for Assertion is :  
 (a) CREATE ASSERTION 'ASSERTION Name' CHECK 'Predicate'  
 (b) CREATE ASSERTION 'ASSERTION Name'  
 (c) CREATE ASSERTION, CHECK Predicate  
 (d) SELECT ASSERTION
17. Which of the following concurrency protocol ensures both conflict serializability and freedom from deadlock ?  
 (a) 2-phase locking      (b) Time stamp-ordering  
 (c) Both (a) and (b)      (d) Neither (a) nor (b)
18. Drop table cannot be used to drop a table referenced by Foreign key constraint.  
 (1) Primary key      (2) Sub key      (3) Super key      (4) Foreign key  
 (a) (1)      (b) (1), (2) and (3)      (c) (4)      (d) (1) and (4)
19. Database applications were built directly on top of file system to overcome the following drawbacks of using file-systems:  
 (1) Data redundancy and inconsistency      (2) Difficulty in accessing data  
 (3) Data isolation      (4) Integrity problems  
 (a) (1)      (b) (1) and (4)      (c) (1), (2) and (3)      (d) (1), (2), (3) and (4)
20. For a weak entity set to be meaningful, it must be associated with another entity set in combination with some of their attributes values, is called as :  
 (a) Neighbour Set      (b) Strong Entity Set      (c) Owner Entity Set      (d) Weak Set
21. Consider the given graph



Its Minimum Cost Spanning Tree is \_\_\_\_\_.





22. The inorder and preorder traversal of binary tree are dbeafcg and abdecfg respectively. The post-order traversal is\_\_\_\_\_.
- (a) dbefacg                      (b) debfagc                      (c) dbefcga                      (d) debfgca
23. Level order traversal of a rooted tree can be done by starting from root and performing :
- (a) Breadth First Search                      (b) Depth First Search  
(c) Root Search                      (d) Deep Search
24. The average case occurs in the Linear Search Algorithm when :
- (a) The item to be searched is in some where middle of the array  
(b) The item to be search is not in the array  
(c) The item to be search is in the last of the array  
(d) The item to be search is either in the last or not in the array
25. To determine the efficiency of an algorithm the time factor is measured by :
- (a) Counting micro seconds                      (b) Counting number of key operations  
(c) Counting number of statements                      (d) Counting kilobytes of algorithm
26. Which of the following protocols is an layer protocol that establishes, manages and terminates multimedia sessions ?
- (a) Session Maintenance Protocol                      (b) Real - time Streaming Protocol  
(c) Real - time Transport Control Protocol                      (d) Session Initiation Protocol
27. Match the following port numbers with their uses :
- | <b>List – I</b> |  | <b>List – II</b>  |  |
|-----------------|--|-------------------|--|
| A. 23           |  | i. World wide web |  |
| B. 25           |  | ii. Remote Login  |  |
| C. 80           |  | iii. USENET news  |  |
| D. 119          |  | iv. E-mail        |  |
- Codes :**
- |     | <b>A</b> | <b>B</b> | <b>C</b> | <b>D</b> |
|-----|----------|----------|----------|----------|
| (a) | iv       | i        | ii       | iii      |
| (b) | ii       | i        | iv       | iii      |
| (c) | ii       | iv       | iii      | i        |
| (d) | ii       | iv       | i        | iii      |
28. Which of the following is not associated with the session layer ?
- (a) Dialog control                      (b) Token management  
(c) Semantics of the information transmitted                      (d) Synchronization
29. What is the size of the 'total length' field in IPv 4 datagram ?
- (a) 4-bits                      (b) 8-bits                      (c) 16-bits                      (d) 32-bits
30. Which of the following is/are restriction(s) in classless addressing ?
- (a) The number of addresses needs to be a power of 2  
(b) The mask needs to be included in the address to define the block  
(c) The starting address must be divisible by the number of addresses in the block  
(d) All of the above
31. Match the following :
- | <b>List – I</b>            |  | <b>List – II</b>                    |  |
|----------------------------|--|-------------------------------------|--|
| A. Forward Reference Table |  | i. Assembler directive              |  |
| B. Mnemonic Table          |  | ii. Uses array data structure       |  |
| C. Segment Register Table  |  | iii. Contains machine OP code       |  |
| D. EQU                     |  | iv. Uses linked list data structure |  |

**Codes :**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
(a)	ii	iii	iv	i
(b)	iii	iv	ii	i
(c)	iv	i	iii	ii
(d)	iv	iii	ii	i

32. The translator which performs macro calls expansion is called :
- (a) Macro processor (b) Micro pre-processor  
(c) Macro pre-processor (d) Dynamic Linker
33. If all the production rules have single non-terminal symbol on the left side, the grammar defined is :
- (a) context free grammar (b) context sensitive grammar  
(c) unrestricted grammar (d) phrase grammar
34. Which one form the following is false ?
- (a) LALR parser is Bottom-Up parser  
(b) A parsing algorithm which performs a left to right scanning and a right most deviation is RL (1).  
(c) LR parser is Bottom - Up parser.  
(d) In LL(1), the 1 indicates that there is a one-symbol look - ahead.
35. Which phase of compiler generates stream of atoms ?
- (a) Syntax Analysis (b) Lexical Analysis (c) Code Generation (d) Code Optimization
36. A disk drive has 100 cylinders, numbered 0 to 99. Disk request come to the disk driver for cylinders 12, 26, 24, 4, 42, 8 and 50 in that order. The driver is currently serving a request at cylinder 24. A seek takes 6 msec per cylinder moved. How much seek time is needed for shortest seek time first (SSTF) algorithm?
- (a) 0.984 sec (b) 0.396 sec (c) 0.738 sec (d) 0.42 sec
37. Let  $P_i$  and  $P_j$  be two processes,  $R$  be the set of variables read from memory, and  $W$  be the set of variables written to memory. For the concurrent execution of two processes  $P_i$  and  $P_j$  which of the following conditions is not true ?
- (a)  $R(P_i) \cap W(P_j) = \Phi$  (b)  $W(P_i) \cap R(P_j) = \Phi$   
(c)  $R(P_i) \cap R(P_j) = \Phi$  (d)  $W(P_i) \cap W(P_j) = \Phi$
38. A LRU page replacement is used with four page frames and eight pages. How many page faults will occur with the reference string 0172327103 if the four frames are initially empty ?
- (a) 6 (b) 7 (c) 5 (d) 8
39. What does the following command do ?  
`grep -vn "abc" x`
- (a) It will print all of the lines in the file  $x$  that match the search string "abc".  
(b) It will print all of the lines in file  $x$  that do not match the search string "abc".  
(c) It will print the total number of lines in the file  $x$  that match the string "abc".  
(d) It will print the specific line number of the file  $x$  in which there is a match for string "abc".
40. The Unix Kernal maintains two key data structure related to processes, the process table and the user structure. Which of the following information is not the part of user structure ?
- (a) File descriptor table (b) System call state  
(c) Scheduling parameters (d) Kernal stack



41. Match the following :

**List – I**

- A. Size-oriented metrics
- B. Function-oriented metrics
- C. Extended functions point metrics
- D. Function point

**List – II**

- i. uses number of external interfaces as one of the measurement parameter.
- ii. originally designed to be applied to business information systems.
- iii. derived by normalizing quality and/or productivity measures by considering the size of the software.
- iv. uses algorithm characteristics as one of the measurement parameter.

**Codes :**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
(a)	iii	iv	i	ii
(b)	ii	i	iv	iii
(c)	iv	ii	iii	i
(d)	iii	i	iv	ii

42. In which testing strategy requirements established during requirements analysis are validated against developed software ?

- (a) Validation testing (b) Integration testing (c) Regression testing (d) System testing

43. Which process model is also called as classic life cycle model ?

- (a) Waterfall model (b) RAD model (c) Prototyping model (d) Incremental model

44. Cohesion is an extension of :

- (a) Abstraction concept (b) Refinement concept  
(c) Information hiding concept (d) Modularity

45. Which one from the following is highly associated activity of project planning ?

- (a) Keep track of the project progress.  
(b) Compare actual and planned progress and costs.  
(c) Identify the activities, milestones and deliverables produced by a project.  
(d) Both (b) and (c).

46. In the case of parallelization, Amdahl's law states that if P is the proportion of a program that can be made parallel and (1 – P) is the proportion that cannot be parallelized, then the maximum speed-up that can be achieved by using N processors is :

- (a)  $\frac{1}{(1-P) + N \cdot P}$  (b)  $\frac{1}{(N-1)P + P}$  (c)  $\frac{1}{(1-P) + \frac{P}{N}}$  (d)  $\frac{1}{P + \frac{(1-P)}{N}}$

47. Which of the following statement is incorrect for Parallel Virtual Machine (PVM) ?

- (a) The PVM communication model provides asynchronous blocking send, asynchronous blocking receive, and non-blocking receive function.  
(b) Message buffers are allocated dynamically.  
(c) The PVM communication model assumes that any task can send a message to any other PVM task and that there is no limit to the size or number of such messages.  
(d) In PVM model, the message order is not preserved.

48. Which of the following algorithms sort n integers, having the range 0 to (n<sup>2</sup>–1), in ascending order in O(n) time?

- (a) Selection sort (b) Bubble sort (c) Radix sort (d) Insertion sort

49. Which of the following statements is FALSE about weak entity set?
- (a) Weak entities can be deleted automatically when their strong entity is deleted.
  - (b) Weak entity set avoids the data duplication and consequent possible inconsistencies caused by duplicating the key of the strong entity.
  - (c) A weak entity set has no primary keys unless attributes of the strong entity set on which it depends are included.
  - (d) Tuples in a weak entity set are not partitioned according to their relationship with tuples in a strong entity set.
50. Which of the following is not valid with reference to Message Passing Interface MPI ?
- (a) MPI can run on any hardware platform.
  - (b) The programming model is a distributed memory model.
  - (c) All parallelism is implicit.
  - (d) MPI - Comm - Size returns the total number of MPI processes in specified communication.



## PAPER : JUNE 2015

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

#### PAPER-III

**Note:** This paper contains **seventy five (75)** objective type questions of **two (2)** marks each. **All** questions are compulsory. The candidates are required to select the most appropriate answer of each question.

1. For the 8-bit word 00111001, the check bits stored with it would be 0111. Suppose when the word is read from memory, the check bits are calculated to be 1101. What is the data word that was read from memory ?  
(a) 10011001            (b) 00011001            (c) 00111000            (d) 11000110
2. Consider a 32-bit microprocessor, with a 16-bit external data bus, driven by an 8 MHz input clock. Assume that this microprocessor has a bus cycle whose minimum duration equals four input clock cycles. What is the maximum data transfer rate for this microprocessor ?  
(a)  $8 \times 10^6$  bytes/sec    (b)  $4 \times 10^6$  bytes/sec    (c)  $16 \times 10^6$  bytes/sec    (d)  $4 \times 10^9$  bytes/sec
3. The RST7 instruction in 8085 microprocessor is equivalent to :  
(a) CALL 0010 H        (b) CALL 0034 H        (c) CALL 0038 H        (d) CALL 003C H
4. The equivalent hexadecimal notation for octal number 2550276 is :  
(a) FADED                (b) AEOBE                (c) ADOBE                (d) ACABE
5. The CPU of a system having 1 MIPS execution rate needs 4 machine cycles on an average for executing an instruction. The fifty percent of the cycles use memory bus. A memory read/write employs one machine cycle. For execution of the programs, the system utilizes 90 percent of the CPU time. For block data transfer, an IO device is attached to the system while CPU executes the background programs continuously. What is the maximum IO data transfer rate if programmed IO data transfer technique is used?  
(a) 500 Kbytes/sec        (b) 2.2 Mbytes/sec        (c) 125 Kbytes/sec        (d) 250 Kbytes/sec
6. The number of flip-flops required to design a modulo - 272 counter is :  
(a) 8                        (b) 9                        (c) 27                        (d) 11
7. Let  $E_1$  and  $E_2$  be two entities in E-R diagram with simple single valued attributes.  $R_1$  and  $R_2$  are two relationships between  $E_1$  and  $E_2$  where  $R_1$  is one - many and  $R_2$  is many-many.  $R_1$  and  $R_2$  donot have any attribute of their own. How many minimum number of tables are required to represent this situation in the Relational Model ?  
(a) 4                        (b) 3                        (c) 2                        (d) 1
8. The STUDENT information in a university stored in the relation STUDENT (Name, Sex, Marks, Dept\_Name)  
Consider the following SQL Query select Dept\_Name from Student where Sex = 'M' group by Dept\_Name having avg (Marks)>SELECT avg (Marks) from Student. It Returns the Name of the Department for which :  
(a) The average marks of Male students is more than the average marks of students in the same department.  
(b) The average marks of male students is more than the average marks of students in the University.  
(c) The average marks of male students is more than the average marks of male students in the University.  
(d) The average marks of students is more than the average marks of male students in the University.



9. Select the 'False' statement from the following statements about Normal Forms :
- Lossless preserving decomposition into 3NF is always possible
  - Lossless preserving decomposition into BCNF is always possible
  - Any Relation with two attributes is in BCNF
  - BCNF is stronger than 3NF
10. The Relation Vendor Order (V\_no, V\_ord\_no, V\_name, Qty\_sup, unit\_price) is in 2NF because :
- Non\_key attribute V\_name is dependent on V\_no which is part of composite key
  - Non\_key attribute V\_name is dependent on Qty\_sup
  - Key attribute Qty\_sup is dependent on primary\_key unit price
  - Key attribute V\_ord\_no is dependent on primary\_key unit price
11. The relation schemas  $R_1$  and  $R_2$  form a lossless join decomposition of R if and only if :
- $R_1 \cap R_2 \twoheadrightarrow (R_1 - R_2)$
  - $R_1 \rightarrow R_2$
  - $R_1 \cap R_2 \twoheadrightarrow (R_2 - R_1)$
  - $R_2 \rightarrow R_1 \cap R_2$
- Codes :**
- 1 and 2 happens
  - 1 and 4 happens
  - 1 and 3 happens
  - 2 and 3 happens
12. In the indexed scheme of blocks to a file, the maximum possible size of the file depends on :
- The number of blocks used for index and the size of index
  - Size of blocks and size of address
  - Size of index
  - Size of blocks
13. Give the number of principal vanishing point(s) along with their direction for the standard perspective transformation :
- Only one in the direction K
  - Two in the direction I and J
  - Three in the direction I, J and K
  - Only two in the directions J and K
14. Consider a triangle A(0, 0), B(1, 1) and C(5, 2). The triangle has to be rotated by an angle of  $45^\circ$  about the point P(-1, -1). What shall be the coordinates of the new triangle ?
- $A' = (1, \sqrt{2} - 1)$ ,  $B' = (-1, 2\sqrt{2} - 1)$  and  $C' = \left(3\sqrt{2} - 1, \frac{9}{2}\sqrt{2}\right)$
  - $A' = (1, \sqrt{2} - 1)$ ,  $B' = (2\sqrt{2} - 1, -1)$  and  $C' = \left(3\sqrt{2} - 1, \frac{9}{2}\sqrt{2} - 1\right)$
  - $A' = (-1, \sqrt{2} - 1)$ ,  $B' = (-1, 2\sqrt{2} - 1)$  and  $C' = \left(3\sqrt{2} - 1, \frac{9}{2}\sqrt{2} - 1\right)$
  - $A' = (\sqrt{2} - 1, -1)$ ,  $B' = (-1, 2\sqrt{2} - 1)$  and  $C' = \left(3\sqrt{2} - 1, \frac{9}{2}\sqrt{2} - 1\right)$
15. The process of dividing an analog signal into a string of discrete outputs, each of constant amplitude, is called :
- Strobing
  - Amplification
  - Conditioning
  - Quantization
16. Which of the following is not a basic primitive of the Graphics Kernel System (GKS) ?
- POLYLINE
  - POLYDRAW
  - FILL AREA
  - POLYMARKER
17. Which of the following statement(s) is/are incorrect ?
- Mapping the co-ordinates of the points and lines that from the picture into the appropriate co-ordinates on the device or workstation is known as viewing transformation.
  - The right-handed cartesian co-ordinates system in whose co-ordinates we describe the picture is known as world co-ordinate system.
  - The co-ordinate system that corresponds to the device or workstation where the image is to be displayed is known as physical device co-ordinate system.



4. Left-handed co-ordinate system in which the displayed area of the virtual displayed device corresponds to the unit ( $|x|$ ) square whose lower left-hand corner is at the origin of the co-ordinate system, is known as normalized device co-ordinate system.

**Codes :**

- (a) 1 only                      (b) 1 and 2                      (c) 3 only                      (d) 4 only

18. Match the following :

**List – I**

- A. Flood Gun  
B. Collector  
C. Ground  
D. Phosphorus  
E. Writing Gun System

**List – II**

- i. An electron gun designed to flood the entire screen with electrons.  
ii. Partly energised by flooding gun, stores the charge generated by the writing gun.  
iii. Used to discharged the collector.  
iv. Used in memory - tube display and similar to those used in standard CRT.  
v. Used in memory - tube display and basically the same as the electron gun used in a conventional CRT.

**Codes :**

	A	B	C	D	E
(a)	i	ii	iii	iv	v
(b)	ii	iii	i	iv	v
(c)	iii	i	ii	v	iv
(d)	iv	v	i	ii	iii

19. Minimal deterministic finite automaton for the language  $L = \{0^n \mid n \geq 0, n \neq 4\}$  will have :
- (a) 1 final state among 5 states                      (b) 4 final states among 5 states  
(c) 1 final state among 6 states                      (d) 5 final states among 6 states
20. The regular expression corresponding to the language  $L = \{x \in \{0, 1\}^* \mid x \text{ ends with 1 and does not contain substring } 00\}$  is :
- (a)  $(1 + 01)^* (10 + 01)$                       (b)  $(1 + 01)^* 01$   
(c)  $(1 + 01)^* (1 + 01)$                       (d)  $(10 + 01)^* 01$
21. The transition function for the language  $L = \{w \mid n_a(w) \text{ and } n_b(w) \text{ are both odd}\}$  is given by :

$$\delta(q_0, a) = q_1 \quad ; \quad \delta(q_0, b) = q_2$$

$$\delta(q_1, a) = q_0 \quad ; \quad \delta(q_1, b) = q_3$$

$$\delta(q_2, a) = q_3 \quad ; \quad \delta(q_2, b) = q_0$$

$$\delta(q_3, a) = q_2 \quad ; \quad \delta(q_3, b) = q_1$$

The initial and final states of the automata are :

- (a)  $q_0$  and  $q_0$  respectively                      (b)  $q_0$  and  $q_1$  respectively  
(c)  $q_0$  and  $q_2$  respectively                      (d)  $q_0$  and  $q_3$  respectively

22. The clausal form of the disjunctive normal form  $\neg A \vee \neg B \vee \neg C \vee D$  is :

- (a)  $A \wedge B \wedge C \Rightarrow D$                       (b)  $A \vee B \vee C \vee D \Rightarrow \text{true}$   
(c)  $A \wedge B \wedge C \wedge D \Rightarrow \text{true}$                       (d)  $A \wedge B \wedge C \wedge D \Rightarrow \text{false}$

23. Which of the following is false for the programming language PROLOG ?

- (a) A PROLOG variable can only be assigned to a value once  
(b) PROLOG is a strongly typed language  
(c) The scope of a variable in PROLOG is a single clause or rule  
(d) The scope of a variable in PROLOG is a single query

24. Which one of the following is true ?  
(a) The resolvent of two Horn clauses is not a Horn clause  
(b) The resolvent of two Horn clauses is a Horn clause  
(c) If we resolve a negated goal G against a fact or rule A to get clause C then C has positive literal or non-null goal  
(d) If we resolve a negated goal G against a fact or rule A to get clause C then C has positive literal or null goal
25. Which transmission technique guarantees that data packets will be received by the receiver in the same order in which they were sent by the sender ?  
(a) Broadcasting (b) Unicasting (c) Packet switching (d) Circuit switching
26. Which of the following control fields in TCP header is used to specify whether the sender has no more data to transmit ?  
(a) FIN (b) RST (c) SYN (d) PSH
27. Which are the two modes of IP security ?  
(a) Transport and certificate (b) Transport and tunnel  
(c) Certificate and tunnel (d) Preshared and transport
28. A message "COMPUTER NETWORK" encrypted (ignore quotes) using columnar transposition cipher with a key "LAYER". The encrypted message is :  
(a) CTTOEWMROPNRUEK (b) MROUEKCTTPNROEW  
(c) OEWPNRCTTUEKMRO (d) UEKPNRMROOEWCTT
29. Suppose a digitized voice channel is made by digitizing 8 kHz bandwidth analog voice signal. It is required to sample the signal at twice the highest frequency (two samples per hertz). What is the rate required, if it is assumed that each sample requires 8-bits ?  
(a) 32 kbps (b) 64 kbps (c) 128 kbps (d) 256 kbps
30. The maximum payload of a TCP segment is :  
(a) 65, 535 (b) 65, 515 (c) 65, 495 (d) 65, 475
31. An all-pairs shortest-paths problem is efficiently solved using :  
(a) Dijkstra' algorithm (b) Bellman-Ford algorithm  
(c) Kruskal algorithm (d) Floyd-Warshall algorithm
32. The travelling salesman problem can be solved in :  
(a) Polynomial time using dynamic programming algorithm  
(b) Polynomial time using branch-and-bound algorithm  
(c) Exponential time using dynamic programming algorithm or branch-and-bound algorithm  
(d) Polynomial time using backtracking algorithm
33. Which of the following is asymptotically smaller ?  
(a)  $\lg(\lg^*n)$  (b)  $\lg^*(\lg n)$  (c)  $\lg(n!)$  (d)  $\lg^*(n!)$
34. Consider a hash table of size  $m = 100$  and the hash function  $h(k) = \text{floor}(m(kA \bmod 1))$  for  $A = \frac{(\sqrt{5}-1)}{2} = 0.618033$ . Compute the location to which the key  $k = 123456$  is placed in hash table.  
(a) 77 (b) 82 (c) 88 (d) 89
35. Let  $f(n)$  and  $g(n)$  be asymptotically non-negative functions. Which of the following is correct ?  
(a)  $\theta(f(n) * g(n)) = \min(f(n), g(n))$  (b)  $\theta(f(n) * g(n)) = \max(f(n), g(n))$   
(c)  $\theta(f(n) + g(n)) = \min(f(n), g(n))$  (d)  $\theta(f(n) + g(n)) = \max(f(n), g(n))$



36. The number of nodes of height  $h$  in any  $n$ -element heap is \_\_\_\_\_.
- (a)  $h$                       (b)  $2^h$                       (c)  $\text{ceil}\left(\frac{n}{2^h}\right)$                       (d)  $\text{ceil}\left(\frac{n}{2^{h+1}}\right)$
37. In Java, when we implement an interface method, it must be declared as :
- (a) Private                      (b) Protected                      (c) Public                      (d) Friend
38. The Servlet Response interface enables a servlet to formulate a response for a client using the method \_\_\_\_\_.
- (a) `void log(Exception e, String s)`                      (b) `void destroy ()`  
(c) `int get ServerPort()`                      (d) `void set Context Type (String type)`
39. Which one of the following is correct ?
- (a) Java applets can not be written in any programming language  
(b) An applet is not a small program  
(c) An applet can be run on its own  
(d) Applets are embedded in another applications
40. In XML we can specify the frequency of an element by using the symbols :
- (a)  $+ * !$                       (b)  $\# * !$                       (c)  $+ * ?$                       (d)  $- * ?$
41. In XML, DOCTYPE declaration specifies to include a reference to \_\_\_\_\_ file.
- (a) Document type definition                      (b) Document type declaration  
(c) Document transfer definition                      (d) Document type language
42. Module design is used to maximize cohesion and minimize coupling. Which of the following is the key to implemented this rule ?
- (a) Inheritance                      (b) Polymorphism                      (c) Encapsulation                      (d) Abstraction
43. Verification :
- (a) refers to the set of activities that ensures that software correctly implements a specific function  
(b) gives answer to the question - Are we building the product right ?  
(c) requires execution of software  
(d) both (a) and (b)
44. Which design matrix is used to measure the compactness of the program in terms of lines of code ?
- (a) Consistency                      (b) Conciseness                      (c) Efficiency                      (d) Accuracy
45. Requirements prioritisation and negotiation belongs to :
- (a) Requirements validation                      (b) Requirements elicitation  
(c) Feasibility study                      (d) Requirements reviews
46. Adaptive maintenance is a maintenance which \_\_\_\_\_.
- (a) correct errors that were not discovered till testing phase.  
(b) is carried out to port the existing software to a new environment.  
(c) improves the system performance.  
(d) both (b) and (3).
47. A Design concept Refinement is a :
- (a) Top-down approach                      (b) Complementary of Abstraction concept  
(c) Process of elaboration                      (d) All of the above

48. A software design is highly modular if :
- cohesion is functional and coupling is data type.
  - cohesion is coincidental and coupling is data type.
  - cohesion is sequential and coupling is content type.
  - cohesion is functional and coupling is stamp type.
49. Match the following for operating system techniques with the most appropriate advantage :
- | <b>List – I</b>          | <b>List – II</b>   |
|--------------------------|--|
| A. Spooling              | i. Allows several jobs in memory to improve CPU utilization.                                 |
| B. Multiprogramming      | ii. Access to shared resources among geographically dispersed computers in a transparent way |
| C. Time sharing          | iii. Overlapping I/O and computations  |
| D. Distributed computing | iv. Allows many users to share a computer simultaneously by switching processor frequency    |
- Codes :**
- |     | <b>A</b> | <b>B</b> | <b>C</b> | <b>D</b> |
|-----|----------|----------|----------|----------|
| (a) | iii      | i        | ii       | iv       |
| (b) | iii      | i        | iv       | ii       |
| (c) | iv       | iii      | ii       | i        |
| (d) | ii       | iii      | iv       | i        |
50. Which of the following statements is not true for Multi Level Feedback Queue processor scheduling algorithm ?
- Queue have different priorities
  - Each queue may have different scheduling algorithm
  - Processes are permanently assigned to a queue
  - This algorithm can be configured to match a specific system under design
51. What is the most appropriate function of Memory Management Unit (MMU) ?
- It is an associated memory to store TLB
  - It is a technique of supporting multiprogramming by creating dynamic partitions
  - It is a chip to map virtual address to physical address
  - It is an algorithm to allocate and deallocate main memory to a process
52. Dining Philosopher's problem is a :
- |                                 |                               |
|---------------------------------|-------------------------------|
| (a) Producer - consumer problem | (b) Classical IPC problem     |
| (c) Starvation problem          | (d) Synchronization Primitive |
53. In \_\_\_\_\_ allocation method for disk block allocation in a file system, insertion and deletion of blocks in a file is easy.
- |           |            |                |             |
|-----------|------------|----------------|-------------|
| (a) Index | (b) Linked | (c) Contiguous | (d) Bit Map |
|-----------|------------|----------------|-------------|
54. A unix file may be of the type :
- |                  |                    |                 |                          |
|------------------|--------------------|-----------------|--------------------------|
| (a) Regular file | (b) Directory file | (c) Device file | (d) Any one of the above |
|------------------|--------------------|-----------------|--------------------------|
55. Match the following :
- | <b>List – I</b> | <b>List – II</b>                                    |
|-----------------|---|
| A. Intelligence | i. Contextual, tacit, transfer needs learning       |
| B. Knowledge    | ii. Scattered facts, easily transferable            |
| C. Information  | iii. Judgemental                                    |
| D. Data         | iv. Codifiable, endorsed with relevance and purpose |

**Codes :**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
(a)	iii	ii	iv	i
(b)	iii	i	iv	ii
(c)	i	ii	iii	iv
(d)	i	iii	iv	ii

56. Match the following knowledge representation techniques with their applications :

**List – I**

- A. Frames  
B. Conceptual dependencies  
C. Associative networks  
D. Scripts

**List – II**

- i. Pictorial representation of objects, their attributes and relationships  
ii. To describes real world stereotype events  
iii. Record like structure for grouping closely related knowledge  
iv. Structures and primitives to represent sentences

**Codes :**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
(a)	iii	iv	i	ii
(b)	iii	iv	ii	i
(c)	iv	iii	i	ii
(d)	iv	iii	ii	i

57. In propositional logic  $P \leftrightarrow Q$  is equivalent to (Where  $\sim$  denotes NOT) :

- (a)  $\sim (P \vee Q) \wedge \sim (Q \vee P)$                       (b)  $(\sim P \vee Q) \wedge (\sim Q \vee P)$   
(c)  $(P \vee Q) \wedge (Q \vee P)$                       (d)  $\sim (P \vee Q) \rightarrow \sim (Q \vee P)$

58. Which of the following statements is true for Branch - and - Branch search ?

- (a) Underestimates of remaining distance may cause deviation from optimal path.  
(b) Overestimates can't cause right path to be overlooked.  
(c) Dynamic programming principle can be used to discard redundant partial paths.  
(d) All of the above.

59. Match the following with respect to heuristic search techniques

**List – I**

- A. Steepest - accent Hill Climbing  
B. Brach-and-bound  
C. Constraint satisfaction  
D. Means-end-analysis

**List – II**

- i. Keeps track of all partial paths which can be candidate for further exploration  
ii. Discover problem state(s) that satisfy a set of constraints  
iii. Detects difference between current state and goal state  
iv. Considers all moves from current state and selects best moves

**Codes :**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
(a)	i	iv	iii	ii
(b)	iv	i	ii	iii
(c)	i	iv	ii	iii
(d)	iv	ii	i	iii

60. Match the following for methods of MIS development :

**List – I**

- A. Joint Application Design (JAD)
- B. Computer Aided Software Engg
- C. Agile development
- D. Component based technology

**List – II**

- i. Delivers functionality in rapid iteration measured in weeks and needs frequent communication, development, testing and delivery
- ii. Reusable applications generally with one specific function. It is closely linked with idea of web services and service oriented architecture
- iii. Tools to automate many tasks of SDLC
- iv. A group based tool for collecting user requirements and creating system design. Mostly used in analysis and design stages of SDLC

**Codes :**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
(a)	i	iii	ii	iv
(b)	iv	iii	i	ii
(c)	iii	iv	i	ii
(d)	iii	i	iv	ii

61. A context free grammar for  $L = \{w \mid n_0(w) > n_1(w)\}$  is given by :

- (a)  $S \rightarrow 0 \mid 0S \mid 1SS$
- (b)  $S \rightarrow 0S \mid 1S \mid 0SS \mid 1SS \mid 0 \mid 1$
- (c)  $S \rightarrow 0 \mid 0S \mid 1SS \mid S1S \mid SS1$
- (d)  $S \rightarrow 0S \mid 1S \mid 0 \mid 1$

62. Given the following statements :

$S_1$  : If  $L_1$  and  $L_2$  are recursively enumerable language over  $\Sigma$ , then  $L_1 \cup L_2$  and  $L_1 \cap L_2$  are also recursively enumerable.

$S_2$  : The set of recursively enumerable language is countable.

Which of the following is correct ?

- (a)  $S_1$  is correct and  $S_2$  is not correct
- (b)  $S_1$  is not correct and  $S_2$  is correct
- (c) Both  $S_1$  and  $S_2$  are not correct
- (d) Both  $S_1$  and  $S_2$  are correct

63. Given the following grammars :

$$G_1 : S \rightarrow AB \mid aaB$$

$$G_2 : S \rightarrow A \mid B$$

$$A \rightarrow aA \mid \epsilon$$

$$A \rightarrow aAb \mid ab$$

$$B \rightarrow bB \mid \epsilon$$

$$B \rightarrow abB \mid \epsilon$$

Which of the following is correct ?

- (a)  $G_1$  is ambiguous and  $G_2$  is unambiguous grammars
- (b)  $G_1$  is unambiguous and  $G_2$  is ambiguous grammars
- (c) Both  $G_1$  and  $G_2$  are ambiguous grammars
- (d) Both  $G_1$  and  $G_2$  are unambiguous grammars

64. Given the symbols A, B, C, D, E, F, G and H with the probabilities  $\frac{1}{30}, \frac{1}{30}, \frac{1}{30}, \frac{2}{30}, \frac{3}{30}, \frac{5}{30}, \frac{5}{30}$  and  $\frac{12}{30}$  respectively. The average Huffman code size in bits per symbol is :

- (a)  $\frac{67}{30}$
- (b)  $\frac{70}{34}$
- (c)  $\frac{76}{30}$
- (d)  $\frac{78}{30}$



65. The redundancy in images stems from :  
 (a) pixel decorrelation (b) pixel correlation  
 (c) pixel quantization (d) image size
66. In a binary Hamming code the number of check digits is  $r$  then number of message digits is equal to  
 (a)  $2^r - 1$  (b)  $2^r - r - 1$  (c)  $2^r - r + 1$  (d)  $2^r + r - 1$
67. In the Hungarian method for solving assignment problem, an optimal assignment requires that the maximum number of lines that can be drawn through squares with zero opportunity cost be equal to the number of :  
 (a) rows or columns (b) rows + columns  
 (c) rows + columns - 1 (d) rows + columns + 1
68. Consider the following transportation problem :

		→ Warehouse			
		$W_1$	$W_2$	$W_3$	Supply
↓ Factory	$F_1$	16	20	12	200
	$F_2$	14	8	18	160
	$F_3$	26	24	16	90
	Demand	180	120	150	

The initial basic feasible solution of the above transportation problem using Vogel's Approximation Method (VAM) is given below :

		→ Warehouse			
		$W_1$	$W_2$	$W_3$	Supply
↓ Factory	$F_1$	16 (140)	20	12 (60)	200
	$F_2$	14 (40)	8 (120)	18	160
	$F_3$	26	24	16 (90)	90
	Demand	180	120	150	

The solution of the above problem

- (a) is degenerate solution (b) is optimum solution  
 (c) needs to improve (d) is infeasible solution
69. Given the following statements with respect to linear programming problem :
- $S_1$  : The dual of the dual linear programming problem is again the primal problem  
 $S_2$  : If either the primal or the dual problem has an unbounded objective function value, the other problem has no feasible solution.  
 $S_3$  : If either the primal or dual problem has a finite optimal solution, the other one also possesses the same, and the optimal value of the objective functions of the two problems are equal.
- Which of the following is true ?  
 (a)  $S_1$  and  $S_2$  (b)  $S_1$  and  $S_3$  (c)  $S_2$  and  $S_3$  (d)  $S_1$ ,  $S_2$  and  $S_3$
70. Consider the two class classification task that consists of the following points :  
 Class  $C_1$  : [1 1.5] [1 -1.5]  
 Class  $C_2$  : [-2 2.5] [-2 -2.5]  
 The direction boundary between the two classes using single perceptron is given by :  
 (a)  $x_1 + x_2 + 1.5 = 0$  (b)  $x_1 + x_2 - 1.5 = 0$  (c)  $x_1 + 1.5 = 0$  (d)  $x_1 - 1.5 = 0$



71. Let A and B be two fuzzy integers defined as :

$$A = \{(1, 0.3), (2, 0.6), (3, 1), (4, 0.7), (5, 0.2)\}$$

$$B = \{(10, 0.5), (11, 1), (12, 0.5)\}$$

Using fuzzy arithmetic operation given by

$$\mu_{A+B}(z) = \bigoplus_{x+y=z} (\mu_A(x) \otimes \mu_B(y))$$

$$f(A+B) \text{ is } \text{_____} . \left[ \begin{array}{l} \oplus \equiv \max \\ \otimes \equiv \min \end{array} \right]$$

- (a)  $\{(11, 0.8), (13, 1), (15, 1)\}$
- (b)  $\{(11, 0.3), (12, 0.5), (13, 1), (14, 1), (15, 1), (16, 0.5), (17, 0.2)\}$
- (c)  $\{(11, 0.3), (12, 0.5), (13, 0.6), (14, 1), (15, 1), (16, 0.5), (17, 0.2)\}$
- (d)  $\{(11, 0.3), (12, 0.5), (13, 0.6), (14, 1), (15, 0.7), (16, 0.5), (17, 0.2)\}$

72. Suppose the function  $y$  and a fuzzy integer number around  $-4$  for  $x$  are given as  $y = (x - 3)^2 + 2$ .

Around  $-4 = \{(2, 0.3), (3, 0.6), (4, 1), (5, 0.6), (6, 0.3)\}$  respectively. Then  $f(\text{Around } -4)$  is given by :

- (a)  $\{(2, 0.6), (3, 0.3), (6, 1), (11, 0.3)\}$
- (b)  $\{(2, 0.6), (3, 1), (6, 1), (11, 0.3)\}$
- (c)  $\{(2, 0.6), (3, 1), (6, 0.6), (11, 0.3)\}$
- (d)  $\{(2, 0.6), (3, 0.3), (6, 0.6), (11, 0.3)\}$

73. Match the following for unix system calls :

**List - I**

- A. exec
- B. brk
- C. wait
- D. fork

**List - II**

- i. Creates a new process
- ii. Invokes another program overlaying memory space with a copy of an executable file
- iii. To increase or decrease the size of data region
- iv. A process synchronizes with termination of child process

**Codes :**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
(a)	ii	iii	iv	i
(b)	iii	ii	iv	i
(c)	iv	iii	ii	i
(d)	iv	iii	i	ii

74. WOW32 is a :

- (a) Win 32 API library for creating process and threads.
- (b) Special kind of file system to the NT name space.
- (c) Kernal-mode objects accessible through Win 32 API
- (d) Special execution environment used to run 16 bit Windows application on 32-bit machines.

75. The unix command :

$\$ vi \text{ file1 file 2}$

- (a) Edits file 1 and stores the contents of file1 in file 2.
- (b) Both files i.e. file 1 and file 2 can be edited using 'ex' command to travel between the files.
- (c) Both files can be edited using 'mv' command to move between the files.
- (d) Edits file 1 first, saves it and then edits file 2.