

**Instructions to candidates:**

All the sections are compulsory. Section I contains 40 objective type multiple choice questions, each carries 1 mark. In each question you are supposed to select the most appropriate alternative out of the given four. Response "none of these" means your answer is not matching to either of the given alternatives. In Section II you have to attempt any three out of the given five descriptive type questions. Each question in Section II carries 10 marks. Section III has four questions. You have to attempt any two. Each question in Section III carries 15 marks.

**Section - I**

- Valid\_Words is a set of strings that are recognized by "My Laughter Machine (MLM)"  
 $\text{Valid\_Words} = \{ a, \text{abaabaaba}, \text{aba}, \text{abaabaabaabaabaabaabaabaaba} \}$   
 Using this information, and given that  $x$  is a non negative integer, compare the following three regular expressions:  
 (i)  $(\text{aba})^{3x}$       (ii)  $a(\text{baa})^{3x-1}ba$       (iii)  $\text{ab}(\text{aab})^{3x-1}a$   
 (A) (ii) and (iii) are same, (i) is different.      (C) (i), (ii) and (iii) are different.  
 (B) (ii) and (iii) are not same.      (D) (i), (ii) and (iii) are same.
- A tautology in propositional logic is a statement that is always true. A minimal tautology is a tautology that is not an instance of a shorter tautology.  
 Is  $(A \vee B) \rightarrow (A \vee B)$  a minimal tautology?  
 (A) yes      (B) no      (C) maybe      (D) none of these
- A seven-segment display has 4 vertical segments and 3 horizontal segments in a figure-of-8 pattern, to display digits and letters. Assume that a decimal digit has to be displayed, given a 4-bit input. The left bottom segment has to be ON for the digits 0, 2, 6, 8. Let the 4 inputs from most significant to least significant be called A, B, C, D. What is the Boolean function of these four variables to drive the left bottom segment?  
 (A)  $BD'+CD'$       (B)  $B'D + CD'$       (C)  $B'D+CD'$       (D)  $B'D'+C'D'$
- The expression:  $a * (b+c) / ((d-e) * (f+g))$  is in infix notation. What is its prefix equivalent?  
 (A)  $/*a+bc*-de+fg$       (C)  $*/+fg-de+bc a$   
 (B) (i) and (ii)      (D) none of these
- If you are given a trail of the pre-order binary tree traversal to solve the above expression, would it be possible to deduce its trail in post-order and in, in-order traversal?  
 (A) yes      (B) no      (C) maybe      (D) none of these

6. For a specific expression, given any two of the three trails (i.e., pre-order, in-order and post-order), is it possible to deduce the remaining one uniquely?  
 (A) yes (B) no (C) maybe (D) none of these
7. Imagine that instead of a bit (0 or 1), "my-machine" is capable of storing a zit (0, 1 or 2). The biggest unsigned integer that I would be able to store using 1 word (= 9 zits) of "my-machine" would be \_\_\_\_\_  
 (A) 560 (B) 6560 (C) 6561 (D) none of these
8. Which is the biggest signed integer that "my-machine" is able to store in its one word?  
 (A) 6560 (B) 13120 (C) (A) or (B) (D) none of these
9. Given is a relation schema R\_Transport [ Truck (T), Capacity (C), Data (Y), Cargo (G), Destination (D), Value (V) ] with the following functional dependencies { $T \rightarrow C$ ,  $TY \rightarrow G$ ,  $TY \rightarrow D$ ,  $CG \rightarrow V$ }. Is the decomposition of R\_Transport into R1 (TCD) and R2 (TGDVY) dependency preserving?  
 (A) yes (B) no (C) maybe (D) none of these
10. Is this decomposition of R\_Transport into R1 and R2 lossless?  
 (A) yes (B) no (C) maybe (D) none of these
11. The decomposition of R\_Transport into R1 and R2 as given above is in \_\_\_\_\_  
 (A) Un-normalized form (B) 1NF (C) 2NF (D) 3NF
12. Would it be possible to separate out individual alphabets from a given speech signal spectrogram, say for example separate out c, r, i in the input "Cricket fever"?  
 (A) yes (B) no (C) not in a polynomial time (D) none of these
13. In information theory, entropy is \_\_\_\_\_  
 (A) a measure of the uncertainty associated with a random variable.  
 (B) the expected value of the information contained in a message.  
 (C) (A) and (B)  
 (D) none of these
14. Let  $f(x,y)$  be an image. The derivatives  $\partial f/\partial x$ ,  $\partial^2 f/\partial x^2$ ,  $\partial y/\partial x$  etc., have standard interpretations in the image processing. Interpret the mixed derivative  $\partial^2 f/\partial y \partial x$  in this context. In your interpretation, is  $\partial^2 f/\partial y \partial x = \partial^2 f/\partial x \partial y$ ?  
 (A) yes (B) no (C) maybe (D) none of these
15. Compared to expert systems, traceability and knowledge representation in two soft computing tools, namely ANNs and fuzzy sets respectively, could be rated as \_\_\_\_\_  
 (A) (better, worse) (B) (much bad, good) (C) similar performing (D) none of these

16. In an error detection and correction code, a message  $M$  : "You are good students", is stored as  $M'$  : "Youare areyou aregood goodare goodstudents studentsgood". Given that in general the length of  $M$  is  $n$ , what is the space required to store  $M'$ ?
- (A)  $2n$       (B)  $3n$       (C)  $4n$       (D) less than  $4n$
17. The number of straight lines obtained by joining  $n$  points on a circle is \_\_\_\_\_
- (A)  ${}^n C_3$       (B)  ${}^n C_2 - 1$       (C)  ${}^n C_2$       (D) none of these
18. When an error of 1% is made in the length of a square, the percentage error in the area of a square will be \_\_\_\_\_
- (A) 0      (B)  $\frac{1}{2}$       (C) 1      (D) none of these
19. A five digit number divisible by 3 is to be formed using the numerals 0, 1, 2, 3, 4 and 5, and without repeating any numeral. This can be done in \_\_\_\_\_ ways:
- (A) 600      (B) 3125      (C) 216      (D) 240
20. Black Box testing is done \_\_\_\_\_
- (A) to show that software is operational at its interfaces, i.e., input and output  
(B) to examine internal details of code  
(C) at the client side  
(D) none of above
21. The number of students in four classes A, B, C, D and their respective mean marks obtained by each of the class are given below:
- |                    | A  | B  | C  | D  |
|--------------------|----|----|----|----|
| Number of students | 10 | 40 | 30 | 20 |
| Arithmetic mean    | 20 | 30 | 50 | 15 |
- The combined mean of the marks of four classes together will be :
- (A) 32      (B) 50      (C) 20      (D) 15
22. A page fault \_\_\_\_\_
- (A) is an error-specific page.  
(B) is an access to the page not currently in memory.  
(C) is an access to the page used in the previous page reference.  
(D) none of these
23. The cost of the network is usually determined by \_\_\_\_\_
- (A) time complexity      (B) switching complexity  
(C) circuit complexity      (D) none of these
24. A hash function  $f$  is defined as  $f(\text{key}) = \text{key} \bmod 7$ , with linear probing used to resolve collisions. Insert the keys 37, 38, 72, 48, 98 and 11 into the table indexed from 0 to 6. What will be the location of 11?
- (A) 3      (B) 4      (C) 5      (D) 6
25. A good piece of research is a product of \_\_\_\_\_
- (A) collective scholarship      (B) a good research library  
(C) a penetrating and analytical mind      (D) a touch of genius

26. What would be the output of the following program, if run from the command line as "myprog 1 2 3" ?

```
main (int argc, char **argv[ ])
{
    int i ;
    i = argv[1] + argv[2] + argv[3] ;
    printf ("% d", i) ;
}
```

- (A) 123 (B) 6 (C) Error (D) "123"

27. Formulation of hypothesis may not be necessary in \_\_\_\_\_

- (A) survey studies (B) fact finding (historical) studies  
(C) normative studies (D) experimental studies

28. \_\_\_\_\_ refers to the way a GIF file is saved by graphics software

- (A) Dithering (B) Interlacing (C) Balancing (D) Division

29. Which of the following statement(s) are always false?

- (i) The sun will not rise in the east some day.  
(ii) A wooden table is not a table.  
(iii) Delhi city will be drowned under water.  
(iv) Cars run on water as fuel.

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

30. A \_\_\_\_\_ based platform is suitable for a production environment while a \_\_\_\_\_ based platform is suited for a program development environment.

- (A) Interpreter, compiler (B) Assembler, compiler  
(C) Compiler, assembler (D) Compiler, interpreter

31. Which of the following is an appropriate definition of computer?

- (A) A machine that can process information.  
(B) An electronic device that can store, retrieve and process both qualitative and quantitative data quickly and accurately.  
(C) An electronic device that can store, retrieve and quickly process only quantitative data.  
(D) A machine that can store, retrieve and process quickly and accurately only qualitative information

32. Which of the following is an example of circular argument?

- (A) God created man in his image and man created God in his own image.  
(B) God is the source of a scripture and the scripture is the source of our knowledge of God.  
(C) Some of the Indians are great because India is great.  
(D) Rama is great because she is Rama.

33. "Action research" means \_\_\_\_\_
- (A) Longitudinal research  
(B) Applied research  
(C) Research initiated to solve an immediate problem  
(D) Research with a socioeconomic objective
34. Logic of induction is very close to \_\_\_\_\_
- (A) the logic of sampling (B) the logic of observation  
(C) the logic of controlled variable (D) none of these
35. Which of the following statement(s) is wrong?
- (i) 2-phase locking protocol suffers from deadlock.  
(ii) Time stamp protocol suffers from more aborts.  
(iii) Multivalued dependency among attribute is checked at 3 NF level.  
(iv) An entity-relationship diagram is a tool to represent event model.
- (A) i, ii and iii (B) ii, iii and iv (C) iii, iv and i (D) none of these
36. Which of the following indicates evaluation?
- (A) Ram got 45 marks out of 200  
(B) Mohan got 38 percent marks in English  
(C) Shyam got First Division in final examination  
(D) All of these
37. Looking at the very big rally, it was reported that XYZ party will win the election. The conclusion was based on \_\_\_\_\_
- (A) random sampling  
(B) cluster sampling  
(C) systematic sampling  
(D) purposive sampling
38. The activity that is must in experimental research is \_\_\_\_\_
- (A) observation  
(B) control  
(C) manipulation and replication  
(D) reference collection
39. A semaphore count of  $-n$  means that the queue contains \_\_\_\_\_ waiting processes.
- (A)  $n + 1$  (B)  $n$  (C)  $n - 1$  (D) 0
40. Consider a schemata  $H = 1^{*****}1$  in a genetic algorithm. The order and defining length of H are given by:
- (A) 1 and 7 (B) 2 and 6 (C) 3 and 5 (D) none of the above

