

Avinashilingam Institute for Home Science and Higher Education for Women
(Deemed to be University), Coimbatore – 641 043

Master's Degree Examination – November 2018
I Semester

Class : I PG
Major: Computer Science/ Computer Application

Time : 3 hrs
Max. Marks: 60

17MCSC01/17MCAC01 Mathematical Foundation of Computer science

Part A 10 X ½ = 5 marks
Choose the Correct Answer

1. If a matrix $A = [A_{11} A_{12} \cdots A_{1n} A_{21} A_{22} \cdots A_{2n} \cdots A_{n1} A_{n2} \cdots A_{nn}]$, order $(n \times n)$ $A_{ii} = 1$, $A_{ij} = 0$ for $i \neq j$. Then that matrix is known as _____.
a) Identity matrix b) Null matrix c) Singular matrix d) None of the mentioned
2. An anti-symmetric matrix is a one in which _____.
a) All diagonal elements are zero b) All diagonal elements are 1 c) $A = A^T$ d) $A = -A^T$
3. Number of subsets of a set of order three is _____.
a) 2 b) 4 c) 6 d) 8
4. n/m means that n is a factor of m , then the relation T is
a) reflexive, transitive and not symmetric b) reflexive, transitive and symmetric
c) transitive and symmetric d) reflexive and symmetric
5. Which of the following is NOT a possible value of the correlation coefficient?
a) negative 0.9 b) zero c) positive 0.15 d) positive 1.5
6. Two lists of numbers, X and Y , have a correlation of 0.3; X and Z have a correlation of - 0.7
We know that:
a) the stronger correlation is the correlation of X and Y , since it is positive.
b) the stronger correlation is the correlation of X and Z .
c) the two correlations are equally strong, since $1.0 - 0.7 = 0.3$
d) We cannot tell which is stronger without more information.
7. _____ is an ordered rooted tree that graphically represents the semantic information a string derived from a context-free grammar.
a) parse tree b) sequential tree c) FSA d) NFSA
8. Representation Technique of _____ must be labeled by the start symbol.
a) Root vertex b) vertex c) Leaves d) None of these
9. The order of errors the Simpson's rule for numerical integration with a step size is
a) H b) h^2 c) h^3 d) h^4
10. The error in trapezoidal rule is of order _____
a) h b) 1 c) $h/2$ d) h^2

Part B

5 x 4 = 20

Answer ALL questions

Answer should not exceed 200 words or one page

11. a) State and prove Demorgan's law on set using Venn diagram.
[or]
b) Determine whether the given function $f(x) = 7 - 4/3 x$ is a linear function or not?
12. a) A bucket contains 5 red balls and 5 blue balls. Two balls are drawn without replacement. If the first ball is blue find the probability that the second ball is also blue.
[OR]
b) Two dice are rolled. If the first one top with 5 then find the probability that the total of the two will be greater than 7.

13. a) Two ladies were asked to rank 7 different types of lipsticks. The ranks given by them are as follows:

Lipsticks :	A	B	C	D	E	F	G
Lady 1 :	2	1	4	3	5	7	6
Lady 2 :	1	3	2	4	5	6	7

Calculate the rank correlation coefficient.

[OR]

- b) Total of the product of deviations of X and Y series = 3044
Number of pairs of observations = 10
Total of the deviations of X series = -170
Total of derivation of Y series = -20
Total of squares of deviations of X series = 8288
Total of square of deviations of Y series = 2264
Find out the coefficient of correlation when the assumed means of X Series and Y series are 82 and 68 respectively.

14. a) Consider $G = (\{S\}, \{a\}, P, S)$ where P has the following rules $S \rightarrow aS$; $S \rightarrow \epsilon$
[OR]

- b) Write short notes on Context free grammar.

15. a) Use Simpson's rule with $n = 6$ to estimate

$$\int_1^4 \sqrt{1+x^3} dx$$

[OR]

- b) The following points were found empirically.

X	2.1	2.4	2.7	3.0	3.3	3.6
Y	3.2	2.7	2.9	3.5	4.1	5.2

Use the trapezoidal rule to estimate $\int_{2.1}^{3.6} y dx$

Part C

5 x 7 = 35

Answer ALL questions

Answer should not exceed 600 words or three pages

16. a) Find the eigen values and associated eigenvectors of the matrix,

$$A = \begin{bmatrix} 7 & 0 & -3 \\ -9 & -2 & 3 \\ 18 & 0 & -8 \end{bmatrix}$$

[or]

- b) Find the inverse of matrix.

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 9 & 2 & 0 \\ 5 & 0 & 3 \end{bmatrix}$$

17. a) State and Prove Bayes Theorem.

[OR]

b) A problem in statistics is given to five students A, B, C, D and E. Their chances of solving it are $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$ and $\frac{1}{6}$. What is the probability that the problem will be solved?

18. a) The table below shows the height, x , in inches and the pulse rate, y , per minute, for 9 people. Find the correlation coefficient and interpret your result.

X: 68 72 65 70 62 75 78 64 68
y: 90 85 88 100 105 98 70 65 72

[OR]

b) The following data relates to the scores obtained by salesman of the company in intelligence test and their weekly sales in thousands rupees:

Salesman Intelligence :	A	B	C	D	E	F	G	H	I
Test Scores:	50	60	50	60	80	50	80	40	70
Weekly sales :	30	60	40	50	60	30	70	50	60

a) Obtain the regression equation of sales on intelligence test scores of the salesmen.

b) If the intelligence test scores of a salesman is 65, what would be his expected weekly sales?

19. a) Let $P = \{S \rightarrow ab, S \rightarrow bb, S \rightarrow aba, S \rightarrow aab\}$ with $\Sigma = \{a, b\}$ and $N = \{S\}$. Then $G = (N, \Sigma, P, S)$ is a context-free grammar.

[OR]

b) Consider the language $L = \{a^m b^n c^{m+n} \mid m, n \geq 0\}$. We now give production rules of $S \rightarrow aSb \mid \epsilon$, a CFG which generates L .

20. a) Use Gaussian elimination to solve the system of linear equations

$$x_1 - 2x_2 - 6x_3 = 12; \quad 2x_1 + 4x_2 + 12x_3 = -17; \quad x_1 - 4x_2 - 12x_3 = 22.$$

[OR]

b) Find the solution to the following system of equations using the Gauss-Seidel method.

$$12x_1 + 3x_2 - 5x_3 = 1$$

$$x_1 + 5x_2 + 3x_3 = 28$$

$$3x_1 + 7x_2 + 13x_3 = 76$$
