**Avinashilingam Institute for Home Science and Higher Education for Women**
**Coimbatore-641043.**

**Master's Degree Examination – November 2017**

**Semester I**

**Class : I PG** **Time: 3 hours**
**Major : Computer Science/Computer Applications** **Max. Marks: 60**

**17MCSC01/17MCAC01 Mathematical foundation of Computer**

**Part A** **10 X ½ = 5 marks**

**Choose the correct Answer**

1. A square matrix $A = [a_{ij}]_{nxn}$, if $a_{ij} = 0$ for $i < j$ then that matrix is known as_____.
   a) Upper triangular matrix b) Lower triangular matrix c) Unit matrix d) Null matrix

2. Let $A=[a_{ij}]$ be an mxn matrix and k be a scalar then kA is equal to _____.
   a) $[ka_{ij}]_{mxn}$ b) $[a_{ij}/k]_{mxn}$ c) $[k^2 a_{ij}]_{mxn}$ d) None of the mentioned

3. Number of subsets of a set of order 4 is_____
   a) 12 b) 14 c) 16 d) 8

4. The binary relation S = Φ (empty set) on set A = {1, 2,3} is
   a) relexive, transitive and not symmetric b) relexive, transitive and symmetric
   c) transitive and symmetric d) relexive 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. If A and B are sets and AU B= A ∩ B, then____.
   a) A=B b) A = Φ c) b = Φ d) None of these

7. Representation Technique of _____must be labeled by terminal symbol.
   a) Root vertex b) vertex c) Leaves d) None of these

8. Representation Technique of _____must be labeled by non- terminal symbol.
   b) Root vertex b) vertex c) Leaves d) None of these

9. The order of errors the Simpson's rule for numercal integration with a step size h is
   a) h b) $h^2$ c) $h^3$ d) $h^4$

10. Using Newton-Raphson method, find a root correct to three decimal places of the equation sin x = 1 - x
    a) 0.511 b) 0.5 c)0.52 d) 0.53

## Part B 5 X 4 =20

**Each 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) We have drawn two cards from a given deck of 52 cards that too without replacement. Find the probability that both are kings.

[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 co-efficient.

[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) Explain conversion of NDFSA to DFSA

[OR]

b) Write short notes on Context free grammar.

15 a) Use Simpson's rule with n =8 to estimate

$$\int_1^3 e^{x^2} dx$$

[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

**Answer ALL question s**

**Each Answer should not exceed 600 words or three pages**

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

$$A = \begin{bmatrix} 2 & 0 & 1 & -3 \\ 0 & 2 & 10 & 4 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 3 \end{bmatrix}$$

[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 ½, 1/3,1/4, 1/5 and 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 X as age and blood pressure represent Y of 8 person:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| X: | 52 | 63 | 45 | 36 | 72 | 65 | 47 | 25 |
| Y : | 62 | 53 | 51 | 25 | 79 | 43 | 60 | 33 |

Obtain the regression equation of Y on X and find the expected blood pressure of a person who is 49 years old.

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

[OR]

b) Consider the language L = $\{a_m b_n c_{m+n} \mid m,n \geq 0\}$. Give production rules of S →aSb | ε, a CFG which generates L.

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

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

[OR]

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

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

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

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