

Master's Degree Examination – November 2017

Semester I

**Class : I PG
Major : Computer Science/Computer Applications**

**Time: 3 hours
Max. Marks: 60**

17MCSC01/17MCAC01 Mathematical foundation of Computer

Part A

10 X ½ = 5 marks

Choose the correct Answer

1. A square matrix $A = [a_{ij}]_{n \times n}$, 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 $m \times n$ matrix and k be a scalar then kA is equal to _____.
a) $[ka_{ij}]_{m \times n}$ b) $[a_{ij}/k]_{m \times n}$ c) $[k^2 a_{ij}]_{m \times n}$ 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 $S = \Phi$ (empty set) on set $A = \{1, 2, 3\}$ 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. If A and B are sets and $A \cup B = A \cap B$, then _____.
a) $A=B$ b) $A = \Phi$ c) $b = \Phi$ 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.
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 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

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 $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$ 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 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 $P = \{S \rightarrow ab, S \rightarrow bb, S \rightarrow aba, S \rightarrow aab\}$ with $\Sigma = \{a, b\}$ and $N = \{S\}$. Then $G = (N, \Sigma, P, S)$ is a context-free grammar.

[OR]

b) Consider the language $L = \{a_m b_n c_{m+n} \mid m, n \geq 0\}$. 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.

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

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

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