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DE-5704

M. C. A. (Sem. I) Examination

March/April – 2016

105 : Mathematical Foundation of Computer Science (Old & New Course)

Time : 3 Hours] [Total Marks : 70

Instruction :

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ M. C. A. (Sem. I)

Name of the Subject :

☛ 105 : Mathematical Foundation of Computer Science (Old & New)

☛ Subject Code No. : 5 7 0 4 ☛ Section No. (1, 2,.....) : Nil

Seat No. :

Student's Signature

Q.1. Answer any FOUR of the following [16]

A) Find the rank of the following matrices.

$$A = \begin{bmatrix} 6 & 7 & 8 \\ 0 & 1 & 0 \\ 2 & 1 & 1 \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 1 & 2 \\ 0 & 5 & 4 \end{bmatrix}.$$

B) If $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 0 & 1 & 2 \end{bmatrix}$ then find $A + A^T$ and AA^T. Also verify that $A + A^T$ is a symmetric matrix.

C) Define (i) nonsingular matrix, (ii) idempotent matrix, (iii) scalar matrix.

D) Let $A = \begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix}$ and $A + 2B = A^2$ then find B.

E) Define inverse of a matrix and find it for the following matrix.

$$A = \begin{bmatrix} 3 & 2 & 1 \\ 0 & -4 & 3 \\ 8 & 12 & -5 \end{bmatrix}$$

F) Prove that the product of two symmetric matrices of same order is a symmetric matrix if and only if they commute.

Q.2. Answer any FOUR of the following: [16]

A) Draw simple graph with one, two, three and four vertices.

B) Prove that if a graph has exactly two vertices of odd degree, there must be a path joining these two vertices.

C) Define tree. Prove that if in a graph G, there is one and only one path between every pair of vertices then G is a tree.

D) Prove that any connected graph with n vertices and $n - 1$ edges is a tree.

E) Prove that a simple graph with n vertices and k components can have at most $(n-k)(n-k+1)/2$ edges.

F) Prove that a graph G with n vertices, $n-1$ edges and no circuits is connected.

Q.3. Answer any FOUR of the following: [16]

A) Make a frequency table with each class interval of 10 : And find mean of that distribution
72, 74, 40, 60, 82, 115, 41, 65, 83, 53, 110, 46, 84, 50, 67, 78, 56, 65, 68, 69, 104, 80, 79, 79, 73, 59, 81, 66, 49, 77, 90, 84, 76, 64, 64, 70, 72, 50, 79, 52, 103, 96, 86, 78, 94.

B) Find the missing frequencies from the following incomplete frequency distribution when median is 46.

Class	10-20	20-30	30-40	40-50	50-60	60-70	70-80	Total
f	12	30	?	65	?	25	18	229

C) Ten competitors in a musical test were ranked by the three judges A, B and C in the following order:

Judge A	1	6	5	10	3	2	4	9	7	8
Judge B	3	5	8	4	7	10	2	1	6	9
Judge C	6	4	9	8	1	2	3	10	5	7

Using rank correlation method. Discuss which pair of judges has the nearest approach to common liking in music.

D) From the following data find the two regression lines. And find the correlation coefficient r.

x	13	12	10	15	20
y	20	30	20	50	60

E) Calculate the mean , median and mode for the following distribution
Class: 0- 10, 10- 20, 20- 30, 30-40, 40-50, 50-60, 60-70, 70-80
f : 16 , 21 , 24 , 25 , 12 , 31 70 50

F) The mean and standard deviation of 20 items was found to be 20 and 5 respectively. Later it was found that the item 13 was misread as 30. Calculate the correct mean and S.D.

Q.4. Answer any THREE of the following: [12]

A) Prove that every self-loop is a circuit but converse is not true. Give example that holds the result.

B) Solve the following set of equations,
$x+2y+3z=6, y+2z=3, y+z=1.$

C) An analysis of monthly wages paid to the workers of two firms A and B belonging to the same industry gives the following results.

	Firm A	Firm B
Number of workers	500	600
Average daily wage	Rs. 186.00	Rs. 175.00
Variance of distribution of wage	81	100

(i) which firm A or B has a larger wage bill?
(ii) In which firm A or B , is there greater variability in individual wages?
(iii) Calculate
(1) average daily wage, and
(2) the variance of the distribution of wages of all the workers in the two firms, A and B taken together?

D) Define Circuit matrix with an example.

E) Show that $A=\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ satisfies the equation $A^3-6A^2+9A-4I=0$ and hence find A^{-1}.

Q.5. Answer any TWO of the following **[10]**

A) Prove that a given connected graph G is an Euler graph iff all vertices of G are of even degree.

B) The following table shows the ages(X) and blood pressure(Y) of 8 persons.

X :	50	61	43	34	70	63	45	23
Y :	64	55	53	27	81	45	62	35

Obtain the regression equation of Y on X and find the expected blood pressure of a person who is 52 years old.

C) Show that every square matrix can be uniquely expressed as a sum of symmetric and skew symmetric matrices.
