PRN:		Course Code :	PCA101R

First Year MCA End Semester Examination Winter 2023

Computational Mathematics

Day and Date: Tuesday, 12/12/2023 Max Marks: **100**

Time : 2.00 to 5.00 PM Duration: **03** hrs

Instructions: i)All questions are compulsory.
ii) Non Programmable calculator is allowed .

		Marks	Bloom's Level	CO
Q.1	**Attempt the following**			
a)	If $P=\{x/x^2+14x+40=0\}, Q=\{x/x^2-5x+6=0\}$ & $R=\{x/x^2+17x-60=0\}$, then find i) $P\cup Q$, ii) $Q\cap R$, iii) $P\cup(Q\cap R)$, iv) $P\cap(Q\cup R)$, v) $(P\cup Q)^c$.	08	L3	CO1
b)	If A and B are the subsets of the universal set X and $n(X)=50$, $n(A)=35, n(B)=20$ and $n(A'\cap B')=5$, find i) $n(A\cup B)$, ii) $n(A\cap B)$, iii) $n(A'\cap B)$, iv) $n(A\cup B')$	08	L3	CO1
	OR			
b)	A company produces three kinds of products A,B and C. The company studied the performance of 1600 consumers for these three products. It was found that the product A was liked by 1250, the product B was liked by 930 and the product C was liked by 1000. The product A and B were liked by 650, the product B and C were liked by 610 consumers, and the product C and A were liked by 700 consumers. None of the product were liked by 30 consumers. Find number of consumers who liked i)All the three products, ii)Only two of these products	08	L2	CO1
Q.2	**Attempt the following**			
a)	Find the inverse of matrices A by using adjoint method $A=\begin{bmatrix}0&1&2\\1&2&3\\3&1&1\end{bmatrix}$	08	L2	CO2
b)	Find X and Y ,if $X+Y=\begin{bmatrix}5&2\\0&9\end{bmatrix}$ and $X-Y=\begin{bmatrix}3&6\\0&-1\end{bmatrix}$	08	L3	CO2
	OR			
b)	Solve the following equation by using Cramer's rule $x+y+z=6;\ x-y+z=2;\ x+2y-z=2$.	08	L2	CO2
Q.3	**Attempt any two from the following**			
a)	Reduce the matrix A to normal form and find its rank	08	L3	CO2

ESE

$$A=\begin{bmatrix}2 & 3 & 4 & 5\\ 3 & 4 & 5 & 6\\ 4 & 5 & 6 & 7\\ 9 & 10 & 11 & 12\end{bmatrix}$$

b) Solve $x+y+z=3;\ x+2y+3z=4;\ x+4y+9z=6$ — 08 L3 CO2

c) Solve
$x+2y+3z=0;\ 2x+3y+z=0;\ 4x+5y+4z=0;\ x+y-2z=0$ — 08 L3 CO2

Q.4 **Attempt any two from the following**

a) A random variables x has the following probability distribution — 08 L3 CO3

x	1	2	3	4	5	6	7
$p(x)$	k	$2k$	$3k$	k^2	k^2+k	$2k^2$	$4k^2$

i) Find k , ii) $p(x>5)$, iii) $p(0\le x\le 5)$

b) In a box containing 100 transistors 20 of which are defective, 10 are selected at random. By using Binomial distribution, find the probability that i)All will be defective, ii) All are non defective, iii) At least one is defective, — 08 L2 CO3

c) In a sample of 1000 students the mean and standard deviation of marks obtained by the students in a certain test are 14 and 2.5 . Assuming the distribution to be normal find the number of students getting marks. i) between 12 and 15, ii) above 18, iii) below 8. (Given: For a S.N.V. z area between $Z=0$ and $Z=0.4$ is $Z=0.1554$, that area between $Z=0$ and $Z=0.8$ is $Z=0.2881$, that area between $Z=0$ and $Z=1.6$ is $Z=0.4452$, that between area between $Z=0$ and $Z=2.4$ is $Z=0.4918$) — 08 L2 CO3

Q.5 **Attempt any Two of the following**

a) Fit a straight line $y=a+bx$ to the following data — 09 L3 CO4

x	0	1	2	3	4
y	1	1.8	3.3	4.5	6.3

b) By the method of least squares find the values of a,b,c in the law $y=a+bx+cx^2$ to fit the following data — 09 L2 CO4

x	0	1	2	3	4
y	1	1.5	1.5	2.5	3.5

c) Find the equation of the lines of regression and also the co-efficient of correlation from the following data — 09 L2 CO4

x	10	14	18	22	26	30
y	18	12	24	6	30	36

ESE

Q.6 **Attempt any Two of the following**

a) Consider the problem of assigning five jobs to five persons. The assignment costs are given as follows. Determine the optimum assignment schedule — 09 L3 CO4

	Job					
Person		1	2	3	4	5
	A	11	17	8	16	20
	B	9	7	12	6	15
	C	13	16	15	12	16
	D	21	24	17	28	26
	E	14	10	12	11	15

b) A company is producing a single product and selling it through five agencies situated in different cities. All of a sudden, there is a demand for the product in five more cities that do not have any agency of the company. The company is faced with the problem of deciding on how to assign the existing agencies to dispatch the product to the additional cities in such a way that the travelling distance is minimized. The distances (in km) between the surplus and deficit cities are given in the following distance matrix — 09 L3 CO4

	Deficit City					
Surplus city		I	II	III	IV	V
	A	160	130	175	190	200
	B	135	120	130	160	175
	C	140	110	155	170	185
	D	50	50	80	80	110
	E	55	35	70	80	105

Determine the optimum assignment schedule.

c) A company is faced with the problem of assigning six different machines to five different jobs. The costs are estimated as follows (in hundreds of rupees) , Solve the problem assuming that the objective is to minimize the total cost. — 09 L2 CO4

	Jobs					
Machines		I	II	III	IV	V
	I	2.5	5	1	6	1
	II	2	5	1.5	7	3
	III	3	6.5	2	9	4.5
	IV	3.5	7	2	9	4.5
	V	4	7	3	9	6
	VI	6	9	5	10	6

*****

ESE