PRN:		Course Code :	PSC111

First Year **MCA** End Semester Examination Winter 2022

Computational Mathematics

Day and Date: Wednesday, 08/02/23 Max Marks: **100**

Time : 10.30am – 01.30pm Duration: **03** hrs

Instructions: 1) All questions are compulsory.
2) Use Non programmable calculator is allowed

		Marks	Bloom's Level	CO
Q.1	**Attempt the following**			
a)	In a school, there are 30 teachers who teach Mathematics or Physics. Out of these, 18 teach Mathematics and 6 teach both Physics and Mathematics. How many teach Physics only?	08	L1	CO1
b)	For any sets A,B,C taken from universe ∪ then prove that 1) $\overline{A \cup B} = \bar{A} \cap \bar{B}$ 2) $\overline{A \cap B} = \bar{A} \cup \bar{B}$	08	L2	CO1
	OR			
b)	If A={1,3,5,7}; B={2,4,6}; C={2,4,6,8} & U={1,2,3,4,5,6,7,8,9,10} then find i) $A \cap B \cap C$ ii) $A \cup B$ iii) $A \quad (B \cap C)$ iv) $\lvert p(A) \rvert$ v) $\lvert p(C) \rvert$ vi) $\bar{A}, \bar{B}$ vii) $\overline{A \cap B \cap C}$ viii) $U \quad (A \cup B \cup C)$	08	L2	CO1
Q.2	**Attempt the following**			
a)	Find the inverse of $A = \begin{bmatrix} 2 & -1 & 3 \\ 1 & 1 & 1 \\ 1 & -1 & 1 \end{bmatrix}$ by using adjoint method.	08	L2	CO2
b)	Solve the equations by crammer's rule. $x + y + z = 3 \; ; \; x + 2y + 3z = 4 \; ; \; x + 4y + 9z = 6$	08	L2	CO2
	OR			
b)	i) Find the determinant of $\begin{bmatrix} 3 & 1 & 1 \\ 2 & 3 & 4 \\ 3 & 5 & 2 \end{bmatrix}$	08	L1	CO2
	ii) Find AB, if $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$ & B= $\begin{bmatrix} 1 & 0 & 1 \\ 2 & 1 & 2 \\ 4 & 1 & 3 \end{bmatrix}$			
Q.3	**Attempt any two from the following**			
a)	Reduce the following matrix to normal form and find its rank. A= $\begin{bmatrix} 1 & -1 & 2 & -3 \\ 4 & 1 & 0 & 2 \\ 0 & 3 & 1 & 4 \\ 0 & 1 & 0 & 2 \end{bmatrix}$	08	L2	CO2
b)	Test for consistency and hence solve : $x + y = 1 \; ; \; 2x + 3y = 1 \; ; \; 5x - y = 11$	08	L2	CO2

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c) Solve $x_1 + 2x_2 + 3x_3 = 0$; $2x_1 + 3x_2 + x_3 = 0$; $4x_1 + 5x_2 + 4x_3 = 0$; $x_1 + x_2 - 2x_3 = 0$ — 08 L2 CO2

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

a) Fit a Poisson distribution to data — 08 L2 CO3

i)

Number of deaths	0	1	2	3	4
Frequencies	123	59	14	3	1

ii)

X	0	1	2	3	4	Total
Y	211	90	19	5	0	325

b) In a Binomial distribution consisting of 5 independent trials, probabilities of 1 and 2 successes are 0.4096 and 0.2048 respectively. Find the parameter 'p' of distribution. — 08 L2 CO3

c) A discrete random variable X has the following probability distribution. — 08 L2 CO3

X	-2	-1	0	1	2	3
P(X)	0.1	k	0.2	2k	0.3	k

Find i) k ii) Mean iii) Variance

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

a) Fit a least square Geometric curve $y = ax^b$ for the following data. — 09 L4 CO4

X	1	2	3	4	5
Y	0.5	2	4.5	8	12.5

b) Calculate the correlation coefficient for the following data. — 09 L3 CO4

Students	1	2	3	4	5
Maths(x)	5	7	9	3	6
Science(y)	6	6	8	1	5

c) For bivariate distribution if n=18 : $\sum x^2 = 60$, $\sum y^2 = 96$, $\sum x = 12$, $\sum y = 18$, $\sum xy = 48$ then find equation of both lines of regression and value of r. — 09 L3 CO4

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

a) Solve the following assignment problems. — 09 L3 CO4

i)

Machine ↓ / Job →	J_1	J_2	J_3	J_4
M_1	2	10	9	7
M_2	15	4	14	8
M_3	13	14	16	11
M_4	4	15	13	9

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ii)

Jobs ↓	Machine →	M_1	M_2	M_3	M_4	M_5
J_1		10	11	4	2	8
J_2		7	11	10	14	12
J_3		5	6	9	12	14
J_4		13	15	11	10	7

b) Solve the following assignment problem by Hungarian method. 09 L3 CO4

i)

Persons ↓	Job →	J_1	J_2	J_3	J_4
P_1		8	26	17	11
P_2		13	28	4	26
P_3		28	19	18	15
P_4		19	26	24	10

ii)

Persons ↓	Job →	J_1	J_2	J_3	J_4
P_1		9	27	18	12
P_2		14	29	5	27
P_3		39	20	19	16
P_4		20	27	25	11

c) Find the assignment of operators jobs that will results in a maximum profit. Which job should be declined? 09 L3 CO4

Machine ↓	Job →	J_1	J_2	J_3	J_4	J_5
M_1		6.20	7.80	5.00	10.10	8.20
M_2		7.10	8.40	6.10	7.30	5.90
M_3		8.70	9.20	11.10	7.10	8.10
M_4		4.80	6.40	8.70	7.70	8.00

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