

University of Mumbai

Examination First Half 2022 under cluster __ (Lead College: __)

Examinations Commencing from 16 MAY 2022 to 30 MAY 2022

Program: BE COMPUTER ENGINEERING

Curriculum Scheme: Rev2019 (C scheme)

Examination: SE Semester : IV

Course Code: CSC 401 and Course Name: Engineering Mathematics IV

Time: 2 hour 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	If X is a Poisson variate and $P(X=1)=P(X=2)$, then $E(X^2)$ is
Option A:	1
Option B:	5
Option C:	8
Option D:	6
2.	If $A = \begin{bmatrix} 2 & 0 & -1 \\ 0 & 2 & 0 \\ -1 & 0 & 2 \end{bmatrix}$ Eigen value of Adj. A are
Option A:	5,6,2
Option B:	2,3,6
Option C:	5,3,6
Option D:	1,3,6
3.	If $f(z) = \frac{3z^2+z}{z^2-1}$, then residue of f(z) at $z = -1$ is
Option A:	1
Option B:	-1
Option C:	2
Option D:	-2
4.	The value of $\int_C \frac{\cos \pi z}{z^2-1} dz$ where C is the circle $ z = 1/2$
Option A:	πi
Option B:	$2 \pi i$
Option C:	0
Option D:	$-\pi i$
5.	According to Time shifting property of z-transform, if X(z) is the z-transform of x(n) then what is the z-transform of x(n-k)?
Option A:	$z^k X(z)$
Option B:	$z^k X(z)$
Option C:	$X(z+k)$
Option D:	$X(z-k)$
6.	The value of $Z^{-1} \left[\frac{z^2}{(z-a)(z-b)} \right]$ is
Option A:	$\frac{a^{n+1} - b^{n+1}}{a + b}$

Option B:	$\frac{a^{n+1} + b^{n+1}}{a - b}$
Option C:	$\frac{a^{n+1} - b^{n+1}}{a - b}$
Option D:	$\frac{a^{n+1} + b^{n+1}}{a + b}$
7.	If a random variable X follows Poisson distribution such that $P(X=0)=6P(X=3)$, find the mean and variance of the distribution.
Option A:	mean = 1, variance = 1
Option B:	mean = 1, variance = -1
Option C:	mean = 1, variance = 2
Option D:	mean = 1, variance = -2
8.	In normal distribution
Option A:	Mean = Median = Mode
Option B:	Mean < Median < Mode
Option C:	Mean > Median > Mode
Option D:	Mean $\neq$ Median $\neq$ Mode
9.	If the primal LPP has an unbounded solution then the dual has
Option A:	Unbounded solution
Option B:	Bounded solution
Option C:	Feasible solution
Option D:	Infeasible solution
10.	The value of Lagrange's multiplier λ for the following NLPP is Optimize $z = 6x_1^2 + 5x_2^2$ Subject to $x_1 + 5x_2 = 7$ $x_1, x_2 \geq 0$
Option A:	$\lambda = 31/84$
Option B:	$\lambda = 84/31$
Option C:	$\lambda = 13/74$
Option D:	$\lambda = 31/64$

Q2	Solve any Four out of Six	5 marks each																		
A	Given $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$, find the eigenvalues of A. Also find eigenvalues of $4A^{-1}$ and eigenvector of $A^2 - 4I$.																			
B	Evaluate $\int_0^{1+i} (x^2 - iy)dz$ along the path (i) $x^2 = y$ (ii) $y = x$																			
C	Find $Z\{2^k \cos(3k + 2)\}, k \geq 0$.																			
D	The following table gives the number of accidents in a city during a week. Find whether the accidents are uniformly distributed over a week																			
	<table><tr><td>Day</td><td>Sun</td><td>Mon</td><td>Tue</td><td>Wed</td><td>Thu</td><td>Fri</td><td>Sat</td><td>Total</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>	Day	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total										
Day	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total												

	No. of accidents	13	15	9	11	12	10	14	84
E	Solve by Simplex Method <i>Maximise</i> $z = 7x_1 + 5x_2$ Subject to $-x_1 - 2x_2 \geq -6$ $4x_1 + 3x_2 \leq 12$ $x_1, x_2 \geq 0$								
F	Solve the following NLPP <i>Maximise</i> $z = -2x_1^2 - x_2^2 + 10x_1 + 4x_2$ Subject to $2x_1 + x_2 \leq 5$ $x_1, x_2 \geq 0$								

Q3	Solve any Four out of Six	5 marks each
A	Find the Eigen values and Eigen Vectors of the following matrix. $A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 3 & -1 \\ 1 & -1 & 3 \end{bmatrix}$	
B	Evaluate $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$ where C is the circle $ z = 3$	
C	Obtain inverse z-transform $\frac{z+2}{z^2-2z-3}$, $1 < z < 3$	
D	The height of six randomly chosen sailors are in inches: 63,65,68,69,71,72. The height of 10 randomly chosen soldiers are: 61,62,65,66,69,69,70,71,72 and 73.	
E	Solve by the dual Simplex Method <i>Minimise</i> $z = 6x_1 + 3x_2 + 4x_3$ Subject to $x_1 + 6x_2 + x_3 = 10$ $2x_1 + 3x_2 + x_3 = 15$ $x_1, x_2 \geq 0$	
F	Find the relative maximum or minimum of the function $z = x_1^2 + x_2^2 + x_3^2 - 8x_1 - 10x_2 - 12x_3 + 100$	

Q4	Solve any Four out of Six	5 marks each
A	Show that the following matrix is diagonalizable. Also find the diagonal form and a diagonalizing matrix $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$	
B	Evaluate $\int_C \frac{4z^2+1}{(2z-3)(z+1)^2} dz$, $C: z = 4$ using Cauchy's residue theorem.	
C	Find the inverse z-transforms of $F(z) = \frac{z}{(z-1)(z-2)}$; $ z > 2$	

D	If the heights of 500 students is normally distributed with mean 68 inches and standard deviation 4 inches, estimate the number of students having heights (i) greater than 72 inches (ii) less than 62 inches (iii) between 65 and 71 inches.
E	Using Simplex method Maximize $z = 10x_1 + 6x_2 + 5x_3$ Subject to $2x_1 + 2x_2 + 6x_3 \leq 300$ $10x_1 + 4x_2 + 5x_3 \leq 600$ $x_1 + x_2 + x_3 \leq 100$ $x_1, x_2, x_3 \geq 0$
F	Using Lagrange's multiplier optimize $z = 4x_1 + 6x_2 - 2x_1^2 - 2x_1x_2 - 2x_2^2$ subject to $x_1 + 2x_2 = 2$ $x_1, x_2 \geq 0$