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 DATE:17/5/2022 QP CODE :92377 Max. Marks: 80

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S.E.(Information Technology)(Choice Based)(R-2020-21)('C' Scheme) Semester - IV / 41021 - Engineering Mathematics-IV

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 $\lvert z \rvert = 1/2$
Option A:	πi
Option B:	2 πi
Option C:	0
Option D:	- πi
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 ≠ Median ≠ 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

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 *Maximise* $z = 7x_1 + 5x_2$ 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 *Maximise* $z = -2x_1{}^2 - x_2{}^2 + 10x_1 + 4x_2$ 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 $\lvert z\rvert = 3$
C	Obtain inverse z-transform $\frac{z+2}{z^2-2z-3}$, $1 < \lvert z\rvert < 3$
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 *Minimise* $z = 6x_1 + 3x_2 + 4x_3$ 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 $\int_C \frac{4z^2+1}{(2z-3)(z+1)^2} dz$, $C: \lvert z\rvert = 4$ using Cauchy's residue theorem.
C	Find the inverse z-transforms of $F(z) = \frac{z}{(z-1)(z-2)}$; $\lvert z\rvert > 2$

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 $x_1 + 2x_2 = 2$ $x_1, x_2 \geq 0$