Program: BE Computer Engineering

Curriculum Scheme: Revised 2016

Examination: Second Year Semester IV

Course Code: CSC401 and Course Name: Applied Mathematics IV

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Q1.	**The Eigen values of 4A^{-1} +2A + 3I where A=** $\begin{bmatrix} \mathbf{1} & \mathbf{0} \\ \mathbf{2} & \mathbf{4} \end{bmatrix}$ **are**
Option A:	9,12
Option B:	9,15
Option C:	6,3
Option D:	8,13
Q2.	**A test is conducted for** $\boldsymbol{H_0}$: $\boldsymbol{\mu = 20\ with\ \sigma = 4,}$ $\boldsymbol{a\ sample\ of\ size\ 36\ \ has\ \ \overline{x} = 21.4\ \ then\ the\ test\ statistics\ is}$
Option A:	0.35
Option B:	2.1
Option C:	12.9
Option D:	1.29
Q3.	**If** $\boldsymbol{A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & -1 & 0 \\ 1 & 0 & -1 \end{bmatrix}\ then\ the\ minimal\ polynomial\ is}$
Option A:	$f(x) = x^2 - 1$
Option B:	$f(x) = x^2 + 1$
Option C:	$f(x) = x^2 + x - 1$
Option D:	$f(x) = x - 1$
Q4.	**The value of the integral** $\boldsymbol{\int_0^{1+i}(x^2 - iy)dz\ \ along\ the\ path\ y = x}$ **is**
Option A:	$\frac{5}{6} + \frac{i}{6}$
Option B:	$\frac{1}{6} + \frac{5i}{6}$
Option C:	$\frac{1}{6} + \frac{i}{6}$
Option D:	$\frac{5}{6} - \frac{i}{6}$

Q5.	**The Dual of the LPP** $\boldsymbol{Min\ z = x_1 + 2x_2}$ $\boldsymbol{S.t \quad 3x_1 - 2x_2 \geq 4}$ $\boldsymbol{x_1 + 7x_2 \geq 2}$ $\boldsymbol{x_1, x_2 \geq 0}$
Option A:	$Max\ \ w = \ y_1 + 2y_2$ $S.t \quad 4y_1 + 2y_2 \leq 2$ $-2\,y_1 + 7y_2 \leq 3$ $y_1, y_2 \geq 0$
Option B:	$Min\ \ w = \ 4y_1 + 2y_2$ $S.t \quad 43y_1 + 2y_2 \geq 2$ $-2\,y_1 + 7y_2 \geq 3$ $y_1, y_2 \geq 0$
Option C:	$Min\ \ w = \ y_1 + 2y_2$ $S.t \quad 4y_1 + 2y_2 \geq 2$ $-2\,y_1 + 7y_2 \geq 3$ $y_1, y_2 \geq 0$
Option D:	$Max\ \ w = \ 4y_1 + 2y_2$ $S.t \quad 3y_1 + y_2 \leq 1$ $-2\,y_1 + 7y_2 \leq 2$ $y_1, y_2 \geq 0$
Q6.	**The mean and variance of a Binomial variate are 3 and 1.2 then** $n =$
Option A:	3

Option B:	4
Option C:	5
Option D:	6
Q7.	**A continuous random variable X has the following probability density function** $f(x) = k(x + x^2),\ 0 \le x \le 2\quad then\ k =$
Option A:	3/14
Option B:	14/3
Option C:	4/27
Option D:	1/14
Q8.	**The function** $f(z) = \frac{1}{(z-1)^2(z+2)^3}\ has$
Option A:	$Poles\ of\ order\ 2\ \ at\ \ z = -2\ and\ a\ pole\ of\ order\ 3\ at\ \ z = 1$
Option B:	$Poles\ of\ order\ 2\ at\ \ z = 1\ and\ a\ pole\ of\ order\ 3\ at\ \ z = 2$
Option C:	$Poles\ of\ order\ 2\ at\ \ z = -1\ and\ a\ pole\ of\ order\ 3\ at\ \ z = 2$
Option D:	$Poles\ of\ order\ 2\ \ at\ z = 1\ and\ a\ pole\ of\ order\ 3\ at\ \ z = -2$
Q9.	**If the basic variable satisfies the non-negativity constraint, then solution is**
Option A:	Degenerate
Option B:	Feasible
Option C:	Non-Degenerate
Option D:	Non-Feasible
Q10.	Based on the following data the calculated value of χ^2 is
Option A:	2.56
Option B:	9.1691
Option C:	6.35
Option D:	11.31

Data for Q10:

	Smokers	Non-Smokers	Total
Literates	83	57	140
Illiterates	46	68	114
Total	129	125	254

Q2(20 MARKS)	**Solve any FOUR out of SIX. Each question carries 05 marks**
A	Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & -1 \end{bmatrix}$ and hence find A^{-1}
B	The average of marks scored by 32 boys is 72 with standard deviation 8 while that of 36 girls is 70 with standard deviation 6. Test at 1% level of significance whether the boys perform better than the girls.
C	Evaluate $\int_C \frac{e^{2z}}{(z-1)(z-2)} dz$ $where\ C\ is\ the\ circle\ \|z\| = 3.$
D	Monthly salaries of 1000 workers have a normal distribution with mean 575 and a standard deviation of 75. Find the number of workers having salaries between 500 and 625 per month. Also find the minimum salary of the highest paid 200 workers.
E	Use Kuhn Tucker Method to solve the NLPP $Max\ z = 2{x_1}^2 - 7{x_2}^2 - 16x_1 + 2x_2 + 12x_1x_2 + 7$ $S.t \quad 2x_1 + 5x_2 \le 105$ $x_1, x_2 \ge 0$
F	Determine all basic feasible solutions to the following problem $Max\ z = x_1 - 2x_2 + 4x_3$ $S.t \quad x_1 + 2x_2 + 3x_3 = 7$ $3x_1 + 4x_2 + 6x_3 = 15$ $x_1, x_2, x_3 \ge 0$

Q3(20 MARKS)	**Solve any FOUR out of SIX. Each question carries 05 marks**
A	$If\ A = \begin{bmatrix} 2 & 3 \\ -3 & -4 \end{bmatrix}$ find A^{50}
B	Evaluate $\int_0^{2\pi} \frac{d\theta}{5+3sin\theta}$
C	A discrete random variable has the probability density function given below <table><tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>$P(X=x)$</td><td>0.2</td><td>k</td><td>0.1</td><td>$2k$</td><td>0.1</td><td>$2k$</td></tr></table>Find k , mean and Variance
D	Solve by Simplex Method $Max\ z = 7x_1 + 5x_2$ $S.t \quad x_1 + 2x_2 \leq 6$ $4x_1 + 3x_2 \leq 12$ $x_1, x_2 \geq 0$
E	The means of two random samples of size 9 and 7 are 196.42 and 198.82 respectively. The sum of the squares of the deviations from the means are 26.94 and 18.73 respectively. Can the samples be considered to have been drawn from the same population?
F	Evaluate $\int_C \frac{(z+4)^2}{z^4+5z^3+6z^2} dz\ where\ C\ is\ the\ circle\ \lvert z \rvert = 1.$

Q4(20 MARKS)	**Solve any FOUR out of SIX. Each question carries 05 marks**
A	Prove that $A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$ is diagonalizable. Find the diagonal form D and the diagonalizing matrix M.
B	Find the Laurent's series for $f(z) = \frac{4z+3}{z(z-3)(z+2)}$ $valid\ for\ 2 < \lvert z \rvert < 3.$
C	Fit a Poisson distribution to the following data X: 0, 1, 2, 3, 4, TOTAL f: 122, 60, 15, 2, 1, 200
D	Solve by Big M Method $Max\ z = 3x_1 + 2x_2$ $S.t \quad 2x_1 + x_2 \leq 2$ $3x_1 + 4x_2 \geq 12$ $x_1, x_2 \geq 0$
E	A continuous random variable has the following probability density function $f(x) = \begin{cases} ke^{-kx}, x > 0, k > 0 \\ 0 \quad elsewhere \end{cases}$ Find m.g.f and hence find the mean and variance.
F	The number of car accidents in a metropolitan city was found to be 20,17,12,6,7,15,8,5,16 and 14 per month respectively. Use χ^2 test to check whether these frequencies are in agreement with the belief that occurrence of accidents was the same during 10 months period. Test at 5% level of significance.

Table for C:

X	0	1	2	3	4	TOTAL
f	122	60	15	2	1	200