

Applied Mathematics -IV

Program: BE Computer Engineering

Curriculum Scheme: Revised 2016

Examination: Second Year Semester IV

Course Code: CSC401 and Course Name: Applied Mathematics IV

Q1.	The Eigen values of $4A^{-1} + 2A + 3I$ where $A = \begin{bmatrix} 1 & 0 \\ 2 & 4 \end{bmatrix}$ are
Option A:	9,12
Option B:	9,15
Option C:	6,3
Option D:	8,13
Q2.	A test is conducted for $H_0: \mu = 20$ with $\sigma = 4$, a sample of size 36 has $\bar{x} = 21.4$ then the test statistics is
Option A:	0.35
Option B:	2.1
Option C:	12.9
Option D:	1.29
Q3.	If $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & -1 & 0 \\ 1 & 0 & -1 \end{bmatrix}$ 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 $\int_0^{1+i} (x^2 - iy) dz$ 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 $\text{Min } z = x_1 + 2x_2$ S. t $3x_1 - 2x_2 \geq 4$ $x_1 + 7x_2 \geq 2$ $x_1, x_2 \geq 0$
Option A:	$\text{Max } w = y_1 + 2y_2$ S. t $4y_1 + 2y_2 \leq 2$ $-2y_1 + 7y_2 \leq 3$ $y_1, y_2 \geq 0$
Option B:	$\text{Min } w = 4y_1 + 2y_2$ S. t $43y_1 + 2y_2 \geq 2$ $-2y_1 + 7y_2 \geq 3$ $y_1, y_2 \geq 0$
Option C:	$\text{Min } w = y_1 + 2y_2$ S. t $4y_1 + 2y_2 \geq 2$ $-2y_1 + 7y_2 \geq 3$ $y_1, y_2 \geq 0$
Option D:	$\text{Max } w = 4y_1 + 2y_2$ S. t $3y_1 + y_2 \leq 1$ $-2y_1 + 7y_2 \leq 2$ $y_1, y_2 \geq 0$
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 $f(x) = k(x + x^2)$, $0 \leq x \leq 2$ 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																
	<table><tr><td></td><td>Smokers</td><td>Non-Smokers</td><td>Total</td></tr><tr><td>Literates</td><td>83</td><td>57</td><td>140</td></tr><tr><td>Illiterates</td><td>46</td><td>68</td><td>114</td></tr><tr><td>Total</td><td>129</td><td>125</td><td>254</td></tr></table>		Smokers	Non-Smokers	Total	Literates	83	57	140	Illiterates	46	68	114	Total	129	125	254
	Smokers	Non-Smokers	Total														
Literates	83	57	140														
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Total	129	125	254														
Option A:	2.56																
Option B:	9.1691																
Option C:	6.35																
Option D:	11.31																

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 $\text{Max } z = 2x_1^2 - 7x_2^2 - 16x_1 + 2x_2 + 12x_1x_2 + 7$ $\text{S.t. } 2x_1 + 5x_2 \leq 105$ $x_1, x_2 \geq 0$
F	Determine all basic feasible solutions to the following problem $\text{Max } z = x_1 - 2x_2 + 4x_3$ $\text{S.t. } x_1 + 2x_2 + 3x_3 = 7$ $3x_1 + 4x_2 + 6x_3 = 15$ $x_1, x_2, x_3 \geq 0$

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 $\int_0^{2\pi} \frac{d\theta}{5+3\sin\theta}$														
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	x	-2	-1	0	1	2	3	$P(X = x)$	0.2	k	0.1	$2k$	0.1	$2k$
x	-2	-1	0	1	2	3									
$P(X = x)$	0.2	k	0.1	$2k$	0.1	$2k$									
D	Solve by Simplex Method $Max\ z = 7x_1 + 5x_2$ S.t $x_1 + 2x_2 \leq 6$ $4x_1 + 3x_2 \leq 12$ $x_1, x_2 \geq 0$														
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 $ z = 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 $2 < z < 3$.														
C	Fit a Poisson distribution to the following data <table><tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>TOTAL</td></tr><tr><td>f</td><td>122</td><td>60</td><td>15</td><td>2</td><td>1</td><td>200</td></tr></table>	X	0	1	2	3	4	TOTAL	f	122	60	15	2	1	200
X	0	1	2	3	4	TOTAL									
f	122	60	15	2	1	200									
D	Solve by Big M Method $Max\ z = 3x_1 + 2x_2$ $S.t \quad \begin{aligned} 2x_1 + x_2 &\leq 2 \\ 3x_1 + 4x_2 &\geq 12 \\ x_1, x_2 &\geq 0 \end{aligned}$														
E	A continuous random variable has the following probability density function $f(x) = \begin{cases} ke^{-kx}, & x > 0, k > 0 \\ 0 & elsewhere \end{cases}$ 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.														