SE Sem IV (C Scheme) R-2019 "Computer" Dec 2022

8/12/2022

(Time: 3 hours) Max. Marks: 80

N.B. (1) Question No. 1 is compulsory.

(2) Answer any three questions from Q.2 to Q.6.

(3) Use of Statistical Tables permitted.

(4) Figures to the right indicate full marks.

Q1 a) If $A = \begin{bmatrix} 2 & 4 \\ 0 & 3 \end{bmatrix}$ then find the Eigen values of $A^3 + 6A^{-1} + 2I$ [5]

b) Evaluate $\int_0^{1+i} (x^2 + iy)\, dz$,along the path $(i) y = x$, $(ii)\ y = x^2$ [5]

c) Write the dual of the following problem [5]

Maximise $z = 3x_1 + 10x_2 + 2x_3$

subject to $2x_1 + 3x_2 + 2x_3 \leq 8$

$3x_1 - 2x_2 + 4x_3 = 4$

$x_1, x_2, x_3 \geq 0$

d) A certain drug administered to 12 patients resulted in the following change in their Blood Pressure

5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4 [5]

Can we conclude that drug increase the Blood Pressure?

Q2 (a) Using Cauchy's residue theorem evaluate [6]

$\int_C \frac{1-2z}{z(z-1)(z-2)} dz$, Where c is $|z|=1.5$

(b) Verify Cayley-Hamilton theorem and find A^{-1} for $A = \begin{bmatrix} 1 & 8 \\ 2 & 1 \end{bmatrix}$. Hence, find $2A^3 - A^2 - 35A - 44I$. [6]

(c) Solve by Simplex Method [8]

Maximise $z = 4x_1 + 10x_2$

Subject to $2x_1 + x_2 \leq 50$

$2x_1 + 5x_2 \leq 100$

$2x_1 + 3x_2 \leq 90$

$x_1, x_2 \geq 0$

Q3 a) Based on the following data determine if there is a relation between literacy and smoking [6]

	Smokers	Non-smokers
Literates	83	57
Illiterates	45	68

(Given that Critical value of chi-square 1 d. f and 5% L.O.S is 3.841

b) Obtain Laurent's series expansion of $f(z) = \frac{1}{z^2+4z+3}$ [6]

when $(i)\ |z| < 1 \quad (ii)\ 1 < |z| < 3 \quad$ (ii) $|z| > 3$

c) Using the method of Lagrangian multipliers solve the following N.L.P.P [8]

Optimise $z = x_1{}^2 + x_2{}^2 + x_3^2$

Subject to $x_1 + x_2 + 3x_3 = 2$

$5x_1 + 2x_2 + x_3 = 5$

$x_1, x_2, x_3 \geq 0$

Q4a) Using the method of Lagrange's multipliers solve the following N.L.P.P [6]

Optimise $z = x_1{}^2 + x_2{}^2 + x_3{}^2 - 10x_1 - 6x_2 - 4x_3$

Subject to $x_1 + x_2 + x_3 = 7$

$x_1, x_2, x_3 \geq 0$

b) Find the inverse Z-transform of $\frac{1}{z^2-3z+2}$, *if ROC is* $(i)\ |z| < 1 \quad (ii)\ |z| > 2$ [6]

c) Show that the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ is diagonalizable. Find the transforming matrix and the diagonal matrix. [8]

Q5a) Find $Z\{f(k) * g(k)\}$ *if* $f(k) = \left(\frac{1}{2}\right)^k$, $g(k) = cos\pi k$ [6]

b) Find the Eigen values and Eigen Vectors of the following matrix. [6]

$$A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -5 & -2 \end{bmatrix}$$

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