

Maths IV Question Bank

Q1] If $A = \begin{bmatrix} 2 & 4 \\ 0 & 8 \end{bmatrix}$, then find the eigen values of

$$6A^{-1} + A^3 + 2I.$$

Q2] Evaluate $\int_C |z| dz$, where C is the left half of unit circle $|z|=1$ from $z=-i$ to $z=i$.

Q3] Using the Kuhn-Tucker conditions, solve the following NLPP.

$$\begin{aligned} \text{Maximise } & Z = x_1^2 + x_2^2 \\ \text{Subject to } & x_1 + x_2 - 4 \leq 0 \\ & 2x_1 + x_2 - 5 \leq 0 \\ & x_1, x_2 \geq 0 \end{aligned}$$

(Same question using Big-M method too)

Q4] Evaluate $\int_C \frac{e^{2z}}{(z+1)^4} dz$, where C is the circle

$$|z-1|=3$$

Q5] Show that matrix $A = \begin{bmatrix} 5 & -6 & -6 \\ -1 & 4 & 2 \\ 3 & -6 & -4 \end{bmatrix}$ is derogatory.

- Q6 A transmission channel has a per digit error probability $p = 0.01$. Calculate the probability of more than one error in 10 received digits using
- (1) Binomial Distribution
 - (2) Poisson Distribution.

Q7 A die was thrown 132 times & the following frequencies were observed.

No. obtained	1	2	3	4	5	6	Total
frequency	15	20	25	15	29	28	132

Q8 Evaluate $\int_0^{2\pi} \frac{1}{3+2\cos\theta} d\theta$

Q9 Show that matrix $A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$ is diagonalizable

find the transforming matrix M & the diagonal form D

Q10 If $A = \begin{bmatrix} 1 & 0 \\ 2 & 4 \end{bmatrix}$ then find the values of $4A^{-1} + 3A + 2I$

Q11 find the Z-transform of $(k) = a^k$, $k < 0$.

Q12 find inverse Z-transform of $F(z) = \frac{1}{(z-1)(z-3)}$ for

i) $|z| < 1$, ii) $1 < |z| < 3$.

Q13 Obtain Taylor's & Laurent's series expansion of $f(z) = \frac{z-1}{z^2-2z+3}$

Q14 Solve the NLPP

Optimize $Z = 10x_1 + 8x_2 + 6x_3 + 2x_1^2 + x_2^2 + 3x_3^2 - 100$

Subject to $x_1 + x_2 + x_3 = 20$, $x_1, x_2, x_3 \geq 0$

Q15 Using Kuhn Tucker conditions, solve the following NLPP.

Maximise $Z = 2x_1^2 - 7x_2^2 + 12x_1x_2$

Subject to: $2x_1 + 5x_2 \leq 98$

$x_1, x_2 \geq 0$