Time : 3 hours **Marks : 80**

Note

Question one is compulsory

Assume suitable data if necessary

Q1. Solve any four **20**

a. Find out DFT of X(n)={1+5j,2+6j,-2,-2-2j}
b. Define normal distribution with equation
c. Explain Orthogonal projection component for vector. Compute the orthogonal projection of 'u' on 'a' and vector component of 'u' orthogonal to 'a' of following.

u=(-2,1), a=(9,2)

d. Find out Laplace transform of $e^{-3t}\sin^2 t$.
e. Show that an isosceles triangle has the smallest perimeter for a given area and a given base.

Q2. A.

A If a continuous random variable X has probability density function

$$f(x)=\begin{cases} e^{-x} & x\geq 0 \\ 0 & otherwise \end{cases}$$

Find out mean, median, mode and standard deviation. **10**

Q2.B. Find approximate solution to the using Ritz method **10**

$y``-y+x=0$

y(0)=0 ; y(1)=0

Q3. A. Find out circular cross correlation of following sequence using DITFFT. **10**

$x_1(n)=\{1,2,3,4\}$

$x_2(n)=\{5,6,7,8\}$

Q3. B. Given that $\frac{dy}{dx}=1+y^2$ where y(0) find y(0.2) using Range kutta fourth order method with h=0.2 and h=0.3 **10**

Q4. A. Find the least square solution of the linear system AX=b and find orthogonal projection of b on the column space of A. **10**

$$x_1 - x_2 = 4$$

$$3x_1 + 2x_2 = 1$$

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

Q4.B. If $x_1 = \frac{1}{3}[2 \quad -1 \quad 2]^T$ and $x_2 = k[3 \quad -4 \quad 5]^T$ where $k = \frac{1}{50^{1/2}}$. Construct an orthogonal matrix. **10**

Q5.A. Decompose the following matrix using LU decomposition **10**

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 0 \end{bmatrix}$$

Q5.A. Use least square method to fit the line y= a+bx based on the sample **10**

(2,1) , (1/6, -5/6) , (-3/2 ,-2) and (-1/3 ,-2/3)

Estimate the total error.

Q6.a. Explain in detail Gauss elimination method. **8**

b. Explain Wavelet Transform in details with application. **10**

c. What is eigen values ? **2**

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