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| Haldia Institute of Technology | |
| Subject:-B.Tech in ECE | |
| Assignment – V | 3 rd sem. |
| Paper Name: SIGNALS AND SYSTEMS | Paper Code: EC303 |

1. Find the solution of following differential equation using Laplace transform

$$\frac{d^2 y(t)}{dt^2} + 5 \frac{dy(t)}{dt} + 6y(t) = \frac{dx(t)}{dt} + x(t), \text{ where } y(0^-) = 2, y'(0^-) = 1 \text{ and } x(t) = e^{-4t}u(t)$$

CO 3

2. Explain the relationship between S-plane and Z-plane. Find the Z-transform of $x(n) = a^n u(n) - b^n u(-n-1)$ and find the ROC.

CO 3,6

3. a. Find the inverse Z-transform of $X(Z) = \frac{Z^3}{(Z-2)(Z-1)^2}$

b. Find the inverse Z-transform of $X(Z) = \frac{Z+1}{(Z+0.2)(Z-1)}$, $|Z| > 1$ using residue method.

CO 6

4. i. Find the Z-transform of $x(n) = [3 \cdot (3)^n - 4(2)^n]u(n)$ and find the ROC.

CO 6

ii. Find the Z-transform of $x(n) = \left(\frac{1}{3}\right)^{n-1} u(n-1)$ and find the ROC.

iii. Find the Z-transform of $x(n) = na^n u(n)$ and find the ROC.

5. Find Inverse Z-transform using Partial fraction method.

CO 6

a. $X(z) = \frac{1+3z^{-1}}{1+3z^{-1}+2z^{-2}}$, Where ROC is $|z| > 2$

b. $X(z) = \frac{z(z^2-4z+5)}{(z-3)(z-1)(z-2)}$, Where ROC is $2 < |z| < 3$.

6. a. Find Inverse Laplace transform of $X(S) = \frac{1}{(S+4)(S-2)}$, where ROC is $-4 < \text{Re}(S) < 2$.

b. Find Inverse Laplace transform of $X(S) = \frac{S}{(S+2)^2}$

CO 6

7. Find Inverse Z-transform using Residue method.

CO 6

a. $X(z) = \frac{z}{(z-2)(z-3)}$, Where ROC is $|z| < 2$.

b. $X(z) = \frac{z}{(z-1)(z-2)}$, Where ROC is $1 < |z| < 2$.