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Total No. of Questions : 08

M.Tech. (Microelectronics) (Sem.–1)

ADVANCED MATHEMATICS FOR ENGINEERS

Subject Code : ME-807

M.Code : 38407

Time : 3 Hrs. Max. Marks : 100

INSTRUCTIONS TO CANDIDATES :

1. **Attempt any FIVE questions out of EIGHT questions.**
2. **Each question carries TWENTY marks.**

SECTION-A

1. a) Find the Fourier transform of $f(x) = e^{-at^2}$ for $a > 0$.

   b) Find $f(t)$, if $F_s(s) = \frac{s}{1+s^2}$.

2. a) Find Z-transform of $s[n] = u[n] \cos wn$, where $u[n]$ is unit step function.

   b) Find inverse Z-transform of $\frac{z^3}{z^2-1}$.

3. Starting with (0, 0, 0) and using Jacobi method find the next five iteration for the system :

   $5x - y + z = 10,\ 2x + 8y - z = 11,\ -x + y + 4z = 3.$

4. a) Find the extremal of the functional $I[y(x)] = \int_0^{\log 2} (e^{-x}y'^2 - e^x y^2)\, dx$.

   b) State and prove Brachistochrone problem

5. a) Find bilinear transformation whose fixed points are –1 and 1.

   b) Find image of $0 < |z| < 2$ under the mapping $w = \frac{z}{z-1}$

6. a) State and prove Time shifting property of Z transform.

   b) State and prove Convolution theorem for Fourier transforms.

7. a) Using convolution theorem find inverse Z-transform of $\left(\frac{z}{z-a}\right)^3$.

b) Determine z-transform of Z ($e^{-an}\sin(n)$)

8. a) Solve the equation using Gauss-elimination method

$$10x - 2y - 3z - u = 3,$$

$$-2x + 10y - z - u = 15,$$

$$-x - y + 10z - 2u = 27,$$

$$-x - y - 2z + 10u = -9$$

b) Find largest eigen values and the corresponding eigen vector of the matrices

$$A = \begin{bmatrix} -2 & 0 & -1 \\ 1 & -1 & 1 \\ 2 & 2 & 0 \end{bmatrix}$$

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.