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## M.Tech. (ECE) (Sem.-1) ADVANCED MATHEMATICS FOR ENGINEERS Subject Code : EC-501 M.Code : 36202

## Time: 3 Hrs.

Max. Marks : 100

## **INSTRUCTION TO CANDIDATES :**

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

Q1. a) Find the fourier sine and cosine transforms of 
$$f(x) = e^{-ax}$$
 ( $a > 0$ ). (10)

b) If F 
$$(f(x)) = F(s)$$
 then show that  $F(x^n f(x)) = (-i)^n \frac{d^n}{dx^n} F(s)$ . (10)

Q2. a) Find the Z-transform of 
$$\sin\left(\frac{k\pi}{2} + \alpha\right)$$
. (10)

b) If Z (f (k)) = F(z) then show that 
$$Z\left(\sum_{n \to -\infty}^{k} f(n)\right) = \frac{F(z)}{1 - z^{-1}}\right)$$
 (10)

Q3. Apply Gauss-Seidel's iteration method to solve the equations  

$$20x + y - 2z = 17; 3x + 20y - z = -18; 2x - 3y + 20z = 25$$
(20)

- Q4. Show that the transformation  $w=i\frac{1-z}{1+z}$  transform the circle |z|=1 onto the real axis of the *w*-plane and the interior of the circle into the upper half of the w plane. (20)
- Q5. Define Euler's equation and find the shape of the curve of the given perimeter enclosing maximum area. (20)
- Q6. Discuss Hamilton's principle and drive Lagrange's equation. (20)



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Q7. State Parseval's identity for fourier transforms. Prove that

$$\int_{0}^{\infty} \frac{dt}{(a^{2}+t^{2})(b^{2}+t^{2})} = \frac{\pi}{2ab(a+b)}$$
(20)

Q8 .Determine the largest eigen value and the corresponding eigen vector of the matrix

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$
(20)



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.