

(15%) 1. Find the solution of $y''' - 4y' = 10\cos x + 5\sin x$, $y(0) = 3$, $y'(0) = -2$,
 $y''(0) = -1$.

(10%) 2. Find the inverse Laplace transform of $\frac{1}{(s+1)^2}$.

(10%) 3. Find the eigenvalues and eigenvectors of $\begin{bmatrix} i & 0 & 0 \\ 0 & 0 & i \\ 0 & i & 0 \end{bmatrix}$.

(10%) 4. Find the area if the vertices are $(1, 1, 1)$, $(4, 4, 4)$, $(8, -3, 14)$, $(11, 0, 17)$.

(15%) 5. Find the Fourier integral representation of the function

$$f(x) = \begin{cases} 1, & \text{if } |x| < 1 \\ 0, & \text{if } |x| > 1 \end{cases}$$

(15%) 6. Solve the following problem by the method of separating variables

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}, \quad t \geq 0, \quad 0 \leq x \leq L, \quad c: \text{constant},$$

$$u(0, t) = 0, \quad u(L, t) = 0, \quad \text{for all } t,$$

$$u(x, 0) = 0, \quad \left. \frac{\partial u}{\partial t} \right|_{t=0} = g(x).$$

(10%) 7. Find all roots of $\sqrt[3]{1}$ in the complex plane.

(15%) 8. Evaluate the integral $\int_0^{2\pi} \frac{d\theta}{25 - 24\cos\theta}$.