



KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION, IS TREATED AS EXAM MALPRACTICE

Answer any TEN Questions

(10 X 10 = 100 Marks)

1. Solve the equation $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = x^2 + 3$.
2. Solve $x^4 \frac{d^3y}{dx^3} + 2x^3 \frac{d^2y}{dx^2} - x^2 \frac{dy}{dx} + xy = 1$.
3. Find the general solution $x(z^2 - y^2)p + y(x^2 - z^2)q = z(y^2 - x^2)$.
4. By the method of separation of variables, solve $4\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 3z$ subject to $z = e^{-5y}$ when $x = 0$.
5. Find $L[t^2 e^t \sin t]$.
6. Using partial fraction method, find the inverse Laplace transform of $\frac{1}{s(s+3)^3}$.
7. Using Laplace transform, solve the differential equation $y'' + 4y' + 3y = e^{-t}$ given that $y(0) = 1$; $y'(0) = 0$.
8. Solve $y'' + 3y' + 2y = g(t)$, $y(0) = 0$, $y'(0) = 1$ where $g(t) = \begin{cases} 1 & \text{if } 0 \leq t < 1 \\ 0 & \text{if } 1 \leq t \end{cases}$.
9. Expand the function $f(x) = \sin x$, $0 < x < \pi$ in Fourier cosine series.
10. Express $f(x) = x$ in half range cosine series and sine series of periodicity $2l$ in the range $0 < x < l$ and deduce the value of $\frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} + \dots$ to ∞ .
11. Find the Fourier transform of $f(x) = \begin{cases} 1-x^2 & \text{if } |x| < 1 \\ 0 & \text{if } |x| > 1 \end{cases}$
Hence evaluate $\int_0^\infty \left(\frac{x \cos x - \sin x}{x^3} \right) \cos \frac{x}{2} dx$.
12. Using Z-Transform, Solve $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ given that $y_0 = y_1 = 0$.