

SECTION – A

1- a) Determine whether the sequence converges or diverges. If it converges find its limit. $\left\{ \frac{\log(n+1)}{\sqrt{n}} \right\}$ 5

b) Investigate the convergence of an infinite series. $\sum_{n=1}^{\infty} \frac{1}{n^2}$ 5

2- a) Test the series for convergence. $\sum_{n=1}^{\infty} \left(\frac{e^{\tan^{-1} n}}{1+n^2} \right)$ 5

b) Determine whether the series $\sum_{n=1}^{\infty} \left(\frac{2^n}{n^3} \right)$ converges or diverges. 5

3- a) Test the behavior of Alternate Series $\sum (-1)^{n-1} \frac{1}{\log(\log n)^2}$ 5

b) Use the power series to find the value of $\int_0^{1/2} \frac{dx}{1+x^4}$ 5

SECTION – B

4- a) Solve $e^x \left(1 + \frac{dy}{dx} \right) = x e^{-y}$ 5

b) Solve $(x^2 + y^2)dx - 2xy dy = 0$ 5

5- a) Solve the differential equation $(e^y - x) \frac{dy}{dx} = 1$ 5

b) Solve the differential equation $p^2 + x^3 p - 2x^2 y = 0$ 5

6- a) Find the general solution of $(D^2 - 5D + 6)y = \sin 3x$ 5

b) Find the general by U.C $y'' + 8y' + 16y = \sin x$ 5

7- a) Solve $x^2 \frac{d^2 y}{dx^2} - 2x \frac{dy}{dx} + 2y = x^3$ 5

b) Solve $\frac{d^2 y}{dx^2} + y = \operatorname{cosec} x$ 5

8. a) Find the Laplace Transformation of $f(t) = \begin{cases} 0 & \text{if } 0 < t < \lambda/2 \\ \cos t & \text{if } t > \lambda/2 \end{cases}$ 5

b) Compute the inverse Laplace Transformation of $\operatorname{Log} \left(\frac{s^2 + a^2}{s^2 + b^2} \right)$ 5