

Code No: 51002

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, September/October - 2021

MATHEMATICS-I

(Common to CE, EEE, ME, ECE, CSE, IT, AE, AME, MIE)

Time: 3 Hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- 1.a) Examine the convergence or divergence of the series $\sum \frac{4.7.....(3n+1)}{1.2.....n} x^n, x > 0$.
- b) State Cauchy's integral test and hence discuss the convergence of the series $\sum_{n=2}^{\infty} \frac{1}{n \log n}$. [8+7]
- 2.a) Verify Rolle's value theorem for the function $f(x) = x(x-1)(x-2)$ in $[0, 2]$ and Lagrange's mean value Theorem for $g(x) = 1 - 3x$ in $[1, 4]$.
- b) Determine whether the functions $\mu = x + y + z, r = x^3 + y^3 + z^3 - 3xyz$ and $w = x^2 + y^2 + z^2$ are functionally dependent. If so, find the functional relation between them. [8+7]
- 3.a) Find the Evolute of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.
- b) Trace the curve $r = a \sin 2\theta$. [8+7]
- 4.a) Find the volume of the solid of revolution generated by revolving the plane area bounded by the curves $y = x^3, y = 0, x = 2$ about x -axis.
- b) Evaluate $\int_0^{\infty} \int_0^{\infty} e^{-(x^2+y^2)} dx dy$ by changing to polar coordinates. [7+8]
- 5.a) Solve the differential equation $\frac{dy}{dx} = \frac{x(2 \log x + 1)}{\sin y + y \cos y}$
- b) Show that the family of parabolas $y^2 = 4a(a+x)$ is self orthogonal. [8+7]
- 6.a) Find the general solution of $y'' + y' - 2y = x - \cos 2x + e^x$.
- b) Solve $y'' + y = \sec x$ by the method of variation of parameters. [8+7]
- 7.a) Find the Laplace transform of $f(t) = t \cos 2t$.
- b) Apply convolution theorem to find $L^{-1} \left\{ \frac{s^2}{(s^2+1)^2} \right\}$. [7+8]
8. By applying Green's theorem evaluate $\int [(y - \sin x) dx + \cos x dy]$, along the triangle enclosed by the lines $y = 0, x = \frac{\pi}{2}$ and $y = \frac{2x}{\pi}$. [15]