R09

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

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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 $u=x+y+z, r=x^3+y^3+z^3-3xyz$ 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]

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