R09

Code No: 51002

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year Examinations, July - 2021
MATHEMATICS-I
(Common to CE, EEE, ME, ECE, CSE, IT, AE, BT, AME, MIE)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

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1.a) Test the convergence of the series

i) $\frac{1}{1.2}+\frac{2}{3.4}+\frac{3}{5.6}+\cdots\infty$ ii) $\Sigma\frac{(n!)^2}{(2n)!}x^{2n}$.

b) Define absolute and conditional convergence. Test $\sum_{n=2}^{\infty}\frac{(-1)^n}{n(\log n)^2}$ for convergence and absolute convergence. [8+7]

2.a) Verify Lagrange's mean value theorem for the function $f(x)=x^3-3x-1$ in $\left(-\frac{11}{7},\frac{13}{7}\right)$.

b) Given $x+y+z=a$, find the maximum value of $x^m y^n z^p$. [7+8]

3.a) Prove that the radius of curvature at any point of the astroid $x^{2/3}+y^{2/3}=a^{2/3}$, is three times the length of the perpendicular from the origin to the tangent at that point.

b) Trace the curve $y^2=\frac{x^3}{(2a-x)}$ [7+8]

4.a) Find the length of the arc of the parabola $x^2=4ay$ measured from the vertex to one extremity of the latus-rectum.

b) Change the order of integration in $\int_0^1\int_0^{\sqrt{1-x^2}} y^2dxdy$ and hence evaluate it. [7+8]

5.a) Solve $2x\frac{dy}{dx}=10x^3y^5+y$.

b) The number N of bacteria in a culture grew at a rate proportional to N. The value of N was initially 100 and increased to 332 in one hour. What would be the value of N after 1 hour? [7+8]

6.a) Solve by the method of variation of parameters, $y''+4y=\tan 2x$.

b) Solve the differential equation $(D^2-6x+9)y=e^{3x}$. [7+8]

7.a) Find inverse Laplace transform of $\frac{1}{(s-1)^2(s-2)}$ using convolution theorem.

b) Using Laplace transform, solve $y''+4y'+3y=e^{-t}$, $y(0)=0, y'(0)=0$. [7+8]

8.a) Find the unit normal for $\phi = x^3yz$ at (1, -1, 2).

b) Evaluate $\int_C (x+y)dx+(x+z)dy+(y+z)dz$ by using Stoke's theorem where C is the boundary of the triangle with vertices $(2, 0, 0)$, $(0,3, 0)$ and $(0, 0, 6)$. [7+8]

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