LORDSINSTITUTEOFENGINEERINGANDTECHNOLOGY

(UGC AUTONOMOUS)

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Course Code: U23MA101

B.E, I- PRE-FINAL EXAM

MATHEMATICS-I

(Common for CSE/CSD/CIVIL/MECH)

Time: 3 Hours *Max. Marks:* 60

Instructions to the Students:

- **Question No. 1 is compulsory**
- **Answer any 4 questions from Q.No.2 –Q. No7**

1\. a. Show that the Series $1-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+$.......... is absolutely convergent. [2] CO1 BTL2

b. Write the Taylors series expansion of $f(x) = e^x$ about x=1. [2] CO3 BTL1

c. Find $\frac{dw}{dt}$ $if\ w = x^2 + y^2, x = cos^2t, y = sin^2t\ \ at\ t = \frac{\pi}{4}$ [2] CO4 BTL4

d. Evaluate $\int_0^1 \int_x^{\sqrt{x}} (x^2 + y^2)dydx$ [2] CO5 BTL5

e. State Green's theorem on a plane. [2] CO6 BTL1

f. Test the Convergence of the Series $\sum_{n=1}^{\infty}\frac{\sqrt{n}}{n^2+1}$ [2] CO1 BTL2

2\. a. State Logarithmic Test [12] CO1 BTL1

b. Test the Convergence of the Series, CO2 BTL4

$\frac{1}{2}+\left[\frac{2}{3}\right]x+\left[\frac{3}{4}\right]x^2+\left[\frac{4}{5}\right]x^3+.........,x>0.$

3\. a. Prove using Mean value theorem $|sinu - sinv| \leq |u - v|$ [12] CO3 BTL4

b. Show that the evolute of the cycloidx=a(θ-sinθ), y= a(1-cosθ)is another cycloid CO3 BTL4

4\. a. Examine for maximum and minimum values of the function $f(x, y) = x^2 - 3xy + y^2 + 2x$ [12] CO4 BTL4

b. Find the minimum value of $x^2+y^2+z^2$ with the constraint x + y + z = 3a. CO4 BTL5

5\. a. Evaluate a) $\int\int e^{2x+3y}dxdy$ over the triangle bounded by x=0, y=0, x+y=1. [12] CO4 BTL5

b. $\int_0^{4a}\int_{\frac{x^2}{4a}}^{2\sqrt{ax}} dydx$by changing the order of integration. CO4 BTL5

6\. a. Evaluate $\oint xdy - ydx$where c is the triangle with vertices (0,0) (2,0) and (0,1) using Greens theorem. [12] CO3 BTL4

b. Find the Directional Derivative of $f(x, y, z) = x^2 - y^2 + 2z^2$ at the point P(1,2,3) in the direction of the line PQ where Q is the point (5,0,4). CO3 BTL5

7\. Verify Gauss divergence theorem for F= $(x^3 - yz)$ i – $2x^2y$ j + z k taken over the surface of the cube bounded by the plane x=y=z=a and coordinate planes. [12] CO6 BTL4