CONTINUOUS INTERANL ASSESSMENT TEST– I, OCTOBER 2025

First Year/First Semester

MA25C01–APPLIED CALCULUS

Time:1Hr. 30Mins **Maximum: 50 Marks**

Answer ALL questions

PART A(5*2=10Marks)

1. Find the domain and range $f(x) = 3x-2$.
2. Sketch the graph of the absolute value function $f(x) = |x|$.
3. If $x^2 + y^2 = 25$, then find $\frac{dy}{dx}$.
4. If $u = yz + zx + xy$, then find the value of $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = ?$
5. . If $x^y = y^x$, then find $\frac{dy}{dx}$.

PART B (40 Marks)

6. a) Given $f(x) = 2x^3 + 3x^2 - 36x$. Find the intervals of increase or decrease, the local maximum and minimum values, intervals of concavity and the inflexion points. **(16)**

Or

b) Given $y = x^3 - 2x^2 + 3$ find the intervals of increase or decrease, the local maximum and minimum values, intervals of concavity and the inflexion points. **(16)**

7. a) (i) If $u = \sin^{-1}\left(\frac{x^3 - y^3}{x + y}\right)$, then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 2\tan u$ **(8)**

(ii) Obtain the Taylor's series in powers of x and y of a function $f(x, y) = e^x \log(1 + y)$. **(8)**

Or

b) (i) Expand $e^x \cos y$ about $\left(0, \frac{\pi}{2}\right)$ upto the third term using Taylor's series. **(8)**

ii) If $u = \log\left(\frac{x^5 + y^5}{x^3 + y^3}\right)$, then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 2$. **(8)**

8.a) If $f(x)$ is continuous in $(-\infty, \infty)$, where $f(x) = \begin{cases} \frac{x^3 - 8}{x - 2} & , \text{ if } x < 2 \\ ax^2 - bx + 3 & , \text{ if } 2 \le x \le 3 \\ 2x - a + b & , \text{ if } x \ge 3 \end{cases}$

Find the value of a and b. **(8)**

Or

b) Find the extreme values of a function $f(x, y) = x^3 + y^3 - 3x - 12y + 20$. **(8)**