Q.No	Part A (2x5 = 10 marks) (Answer all the questions)	C
1	If $f(x,y) = \log\left(\sqrt{x^2+y^2}\right)$, then show that $\frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} = 0.$	C
2	Find the domain and range $f(x) = 3x - 2$.	C
3	State Euler's theorem on homogeneous functions.	C
4	If $x^2 + y^2 = 25$, then find $\frac{dy}{dx}$.	C
5	By using Lagrange's mean value theorem, find the value of C lying between a and b if $f(x) = x(x-1)(x-2)$.	C

Q.No	Part B - (1 x 8 = 8 marks), (2 x 16 = 32 marks) (Answer all the questions)	C

11 A	i)Examine the extreme values of $f(x,y) = x^3 + y^3 - 3x - 12y + 20$. ii) If $u = \cos^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$, then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = -\frac{1}{2}\cot(u)$.
	OR
11 B	i) Find the equation of the tangent line to the curve $x^3 + y^3 = 6xy$ at the point $(3,3)$ and determine where the tangent line is horizontal in the first quadrant. ii) (a) Verify if the function $x^2 + 2x - 8$ satisfies the Mean Value Theorem in $(-4,4)$. (b)Verify Rolle's theorem for $f(x) = \frac{\sin x}{e^x}$ in $(0,\pi)$.
12 A	Find the intervals on which f is increasing or decreasing, intervals of concavity, and the inflection points: $f(x) = 2 + 2x^2 - x^4$.
	OR
12 B	Find the intervals on which f is increasing or decreasing, local maximum or minimum, intervals of concavity, and the inflection points: $f(x) = 2x^3 + 3x^2 - 36x$.
13 A	Expand $e^x \cos(y)$ about $(0, \frac{\pi}{2})$ up to third term using Taylor's series.