COMSATS University Islamabad, Abbottabad Campus.
Department of Mathematics.

Class: BSE 4A &4B **22/12/2025** **Time 180 minutes** **MVC**

Note: All questions carry equal marks 8*10=80. All questions are mandatory.

Question No. 01: Use polar coordinates to help describe the level curves of $f(x,y) = xy/(x^2+y^2)^{1.5}$. Moreover, investigate $\lim_{(x,y)\to(0,0)} f(x,y)$.

Question No. 02: Find the equation of tangent plane and the normal line to the graph of $7z = 4x^2 - 2y^2$ at P (-2, -1, 2).

Question No. 03: Find the extrema of $f(x,y) = x^2 + 3y - y^3$.

Question No. 04: Evaluate $\int_0^3 \int_{y^2}^9 ye^{(-x^2)}\, dx\, dy$.

Question N0. 05: Change the equation $z + 3r^2 = 9$ to rectangular coordinates and describe its graph in 3D.

Question N0. 06: Change the equation $z = x^2 - y^2$ to cylindrical coordinates and spherical coordinates.

Question N0. 07: Evaluate $\int_c xdx + (x+y)dy + (x+y+z)dz$ for the curve C consists of the line segment from A(0,0,0) to B(2,4,8).

Question N0. 08: If $F(x,y,z) = 2xe^{(2y)}i + 2(x^2e^{(2y)} + ycotz)j - y^2cosec^2zk$, prove that $\int_c F.dr$ is independent of path, and find a potential function for the given vector field.

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