Prabhu Jagatbandhu College
Department of Mathematics
Semester-1, FM-40
Class Test

Answer all questions Time:2hr

1. Find the directional derivative of $\phi = xy^2 + yz^3$ at (2,-1,1) in the direction of normal to the surface $x\log z - y^2 = -4$ at (-1,2,1).
2. Find the directional derivative of $\phi = xy^2 + yz^2 + zx^2$ in the direction of tangent to the surface $x = t, y = t^2, z = t^3$ at (1,1,1).
3. Find the directional derivative of $\phi = 6yx^2 + 24zy^2 - 8xz^2$ at (1,1,1)in the direction parallel to the line $\frac{x-1}{2} = \frac{x-3}{-2} = \frac{z}{1}$. Hence find its maximum value.
4. Find the angle between the curve $ax^2 + y^2 + z^2 - xy = 1$ and $bx^2y + y^2z + z = 1$ at (1,1,0).
5. Find the constant a, b if the directional derivative of $\phi = ay^2 + 2bxy + xz$ at (1,2,-1) is maximum in the direction of the tangent to the curve $\vec{r} = (t^3 - 1)\hat{i} + (3t - 1)\hat{j} + (t^2 - 1)\hat{k}$ at (0,2,0).
6. The temperature of a points in space is given by $\phi = x^2 + y^2 - z$. A mosquito located at (1,1,2) desires to fly in such a direction that it will get warm as soon as possible. In what direction should it move?
7. Find the direction in which the directional derivative of $\phi = \frac{x^2 - y^2}{xy}$ at (1,1) is zero.
8. If the directional derivative of $\phi = ax^2 + by + 2z$ at (1,1,1) is maximum in the direction of $\hat{i} + \hat{j} + \hat{k}$ then find a,b.

September 2018

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