

Jaypee University of Information Technology, Wanknaghat

TEST - II, October 2017

B.Tech (ECE/CSE/CE/IT)

Course Code: 10B11MA111
 Course Title: Mathematics-I
 Course Credits: 4

Max. Marks: 25

Max. Time: 90 min

Instructions: Answer ALL the questions.

1. Suppose that z is defined implicitly as a function of x and y : $ye^{xz} = x^2y + y^2z^2$. Find the partial derivatives $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$. (4 Marks)
2. Evaluate $\iint_{\mathcal{R}} (x-y) \sin(x+y) \, dx \, dy$ over the tilted square region \mathcal{R} with corners at $(0, 0)$, $(\pi, 0)$ and $(\pi/2, \pm\pi/2)$ by doing a change of variables $u = x+y$ and $v = x-y$. (4 Marks)
3. (a) Find an equation of the tangent plane to $xyz^2 = 6$ at $(3, 2, 1)$.
 (b) Find equations of the normal line to $xyz^2 = 6$ at $(3, 2, 1)$. (4 Marks)
4. Consider a force field $\mathbf{F}(x, y) = (y^2/x^2)\mathbf{i} - (2y/x)\mathbf{j}$ applied on an object. (5 Marks)
 (a) Find $f(x, y)$ such that $\nabla f = \mathbf{F}(x, y)$.
 (b) Find the work done by $\mathbf{F}(x, y)$ in moving an object from $\mathcal{P}(1, 1)$ to $\mathcal{Q}(4, -2)$.
5. Find the directional derivative of $f(x, y, z) = xz^2 - 3xy + 2xyz - 3x + 5y - 17$ from the point $(2, -6, 3)$ in the direction of the origin. (4 Marks)
6. Consider the paraboloid $z = x^2 + y^2$. Let S denote that portion of this surface that lies below the plane $z = 1$. Find the surface area of S . (4 Marks)

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