Mid-West University
Examinations Management Office
Surkhet, Nepal
End Semester Examination 2080
B.Ed. Level /VI Semester
Sub: Sub: Multivariable Calculus (Math 463)

Roll No. ....

Group 'A' **10×1=10**

Tick (✓) the Best Answer.

1. The range of the function $g(x,y) = \sqrt{9-x^2-y^2}$ is
   a. $[0,3]$
   b. $[3,0]$
   c. $[-3,3]$
   d. $[3,-3]$

2. Which one of the followings is cylindrical coordinate?
   a. (x,y) b. (r,θ)
   c. (r,θ,z) d. (x,y,z)

3. If $F = Pi + Qj + Rk$ is a vector of field on $\mathbb{R}^3$ and P, Q, R have continuous second order partial derivatives, then
   a. $div\ curl\ F = 0$ b. $div\ curl\ F = 1$
   c. $div\ curl\ F = 2$ d. $div\ curl\ F = -1$

4. If f conservative vector field, then
   a. $CurlF = 0$ b. $CurlF = 1$
   c. $CurlF = 2$ d. $CurlF = 3$

5. The function $V = f(r,h)$ represents the function of volume of cylinder through
   a. Verbally b. Numerically
   c. Algebraically d. IPO

6. The Cartesian coordinate of the point (x,y) is
   a. (r,θ) b. (a,b)
   c. (θ,r) d. (y,x)

7. Let $f(x,y) = x^3y + e^{xy^2}$. Then,
   a. $f_{xy} = f_{yx}$ b. $f_{xy} \neq f_{yx}$
   c. Both a) and b) d. None

8. A point is said to be critical or stationary point of function if...
   a. $f_x(a,b) = 0$ b. $f_y(a,b) = 0$
   c. a) and b) both d. a) only

9. Which one of the followings is not curl?
   a. Curl F b. $\nabla \times F$
   c. Curl F $= \nabla \times F$ d. $\nabla . F$

10. Which one of the followings is Laplace's equation?
   a. $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} = 0$
   b. $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} = 1$
   c. $\frac{\partial^2 u}{\partial x^2} - \frac{\partial^2 v}{\partial y^2} = 0$
   d. $\frac{\partial^2 u}{\partial x^2} - \frac{\partial^2 v}{\partial y^2} = 1$

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Level: B.Ed. / VI Semester FM: 60
Time: 3 hrs PM: 30

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Candidates are requested to give their answers in their own words as far as practicable.

Attempt All the Questions.

Group 'B' $6 \times 5 = 30$

1. If $z = f(x,y) = x^3 + 3xy - y^2$. Then find the differential dz. Also x changes from 2 to 2.05 and y changes from 3 to 2.96, compare the values of Δz and dz.

2. Show that $f_{xy} \neq f_{yx}$ at $(0,0)$ if

$$f(x,y) = \begin{cases} \frac{xy(x^2-y^2)}{x^2+y^2} & x \neq 0, y \neq 0 \\ 0 & f(0,0) = 0 \end{cases}$$

3. Find the volume of the solid that lies under the paraboloid $z = x^2 + y^2$, above the xy-plane and inside the cylinder $x^2 + y^2 = 2x$.

Or

Find the mass and center of mass of a triangular lamina with vertices (0,0), (1,0) and (0,2) if the density function is $\rho(x,y) = 1 + 3x + y$.

4. Evaluate $\iiint_E z dV$, where E is the tetrahedron bounded by the four planes $x = 0, y = 0, z = 0$ and $x + y + z = 1$.

5. Define curl F. If f is a function of three variables that has continuous second order partial derivatives, then show that $curl(\nabla f) = 0$.

6. Evaluate by Green's theorem $\int_C (x^2 - coshy)dx + (y + sinx)dy$, where C is the rectangle with vertices $(0,0), (\pi, 0), (\pi, 1), (0,1)$.

Or

Define surface integral of type second. Evaluate $I = \iint_S (xdydz + dzdx + xz^2dxdy)$, where S is the outer side of the part of the sphere $x^2+y^2 + z^2 = 1$ in the first octant.

Group 'C' $2 \times 10 = 20$

7. Evaluate $\iint_S zdS$, where S is the surface whose sides S_1 are given by cylinder $x^2 + y^2 = 1$ whose bottom S_2 is the disk $x^2 + y^2 \leq 1$ in the plane $z = 0$ and whose top S_3 is the part of the plane $z = 1 + x$ that lies above S_2.

8. State and prove "Gauss Theorem".

Or

If $f(x,y) = sinx + e^{xy}$, then find that $\nabla f(0,1)$. Also find the directional derivative of the function $f(x,y) = x^2y^3 - 4y$ at the point $(2, -1)$ in the direction of the vector $v = 2i + 5j$.

THE END