QP Code: RJ22MSC071 Reg. No | | | | | | | | | | | AR 22

GIET UNIVERSITY, GUNUPUR – 765022

M. Sc (Second Semester) Examinations, July – 2023

22MTPC202 – Advanced Calculus

(Mathematics)

Time: 3 hrs Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A **(2 x 10 = 20 Marks)**

Q.1. Answer ***ALL*** questions

		CO #	Blooms Level
a.	If $f(x,y) = x^y$ find $f_1(x,y), f_2(x,y), f_{12}(x,y)$.	1	K2
b.	Compute Δf for following functions at the given point $f(x,y,z) = x^2yz + 3xz^2$ at (1,2,-1)	2	K2
c.	Discuss the nature of the transformation T of R^2 to R^2 which: sends (x, y) in to (x-y, x +y).	2	K2
d.	When a transformation is continuous at point p_o?	1	K1
e.	Show that $x - y, xy, xe^y$ are functionally dependent.	2	K2
f.	Define uniformly differentiable.	1	K1
g.	If F =x^3yz^2 find grad of 'F' at (1, 1, 1).	1	K2
h.	Write the parametric equations of sphere.	1	K1
i.	If $w = f(x,y)$ and $y = f(x)$ find $\frac{d^2w}{dx^2}$.	2	K1
j.	Is the vector function F=$(y^2 \cos x + z^3)$i +(sinx-4)j +(3xz^2+2)k conservative field.	2	K2

PART – B

<u>Answer ***ANY FIVE*** questions</u>

		Marks	CO #	Blooms Level
2. a.	Let $f \in C'$ in an open ball $B(p_0, r)$ about the point p_0 in n space. Let $p \in B$, and set $p - p_0 = \Delta p = (\Delta x_1, \Delta x_2, \ldots \Delta x_n)$Then, there are points $p_1, p_2, \ldots, p_n$ in B such that $f(p) - f(p_0) = f_1(p_1)\Delta x_1 + f_2(p_2)\Delta x_2 + \ldots + f_n(p_n)\Delta x_n$	5	3	K3
b.	Find the directional derivative of F(x, y, z) = xyz at (1, 2, 3) in the direction from this point toward the point (3, 1, 5).	5	2	K2
3.a.	Let a function f be defined in an open set D of the plane, and suppose that f_1 and f_2 are defined and bounded everywhere in D. show that f is continuous in D.	5	1	K4
b.	By computing ranks, discuss the nature of the image in UVW space of all of XYZ space. If either transformations is nonsingular. Find the equations for its inverse.	5	2	K5

$$\begin{cases} U = y - x \\ V = 3x - y + 3z \\ W = x + z \end{cases}$$

4. a.	State and proof Taylor's remainder theorem.	5	2	K3
b.	The volume of $L(D)$ is $kv(D)$, where $k = \|\delta(L)\|$.	5	2	K2
5.a.	Compute the area of the region bounded by one arc of a cycloid x=(t-sint), y=a(1-cost) and the x-axis.	5	3	K3
b.	Let transformations s be continuous on a set A & T_o be continuous on a set B and let $p_o \in A$ & $S(p_o) = q_o \in B$. Then the product transformation $T(s)$, defined by $T(s(p)) = T(s(p_o) is\ continuous\ at\ p_o$.	5	1	K3
6. a.	Show that T(x,y)= (x+y, x-y) is a linear transformations (x,y)∈R	5	1	K2
b.	Compute the differential of T: $\begin{cases} U: xy^2 - 3x^2 \\ V: 3x - 5y^2 \end{cases}$ at the point (1,-1) & (1,3).	5	3	K4
7.	Verify Green's theorem in plane for $\oint_c (x^2 - 2xy)dx + (x^2y + 3)dy$ where c is the boundary of the region defined by $y^2 = 8x$ and x=2.	10	3	K4
8.	State and proof stoke theorem.	10	2	K3

--- End of Paper ---