Question Bank 3
School of Basics and Applied Science
Mathematics

Course Name: Multivariable Calculus Course Code: BMA101
Date: 05-10-2019

Sl No.	Questions	CO	Bloom's Taxonomy Level	Difficulty Level	Competitive Exam Question Y/N	Area	Topic	Unit	Marks
1	Define function of two variables.	3	K1	L	N	Functions of several variables	Function of several variable	3	2
2	Define level curves.	3	K1	L	N	Functions of several variables	Function of several variable	3	2
3	Find the domain and range of the function $f(x,y) = \frac{2x}{y-x^2}$.	3	K2	M	N	Functions of several variables	Function of several variable	3	2
4	Find the domain and range of the function $f(x,y,z) = xylnz.$	3	K2	M	N	Functions of several variables	Function of several variable	3	2
5	Plot the level curves $f(x,y) = 51$, and $f(x,y) = 75$ in the domain of the function $f(x,y) = 100 - x^2 - y^2$ in the plane.	3	K2	M	N	Functions of several variables	Function of several variable	3	2
6	Find the limit: $\lim_{(x,y)\to(0,ln2)} e^{x-y}$	3	K3	M	N	Functions of several variables	Limit and continuity	3	2
7	Find the limit: $\lim_{(x,y)\to(0,0)} \frac{x^2-xy}{\sqrt{x}-\sqrt{y}}$	3	K3	M	N	Functions of several variables	Limit and continuity	3	2
8	Find the limit: $\lim_{(x,y)\to(0,1)} \frac{x-xy+3}{x^2y+5xy-y^3}$	3	K3	M	N	Functions of several variables	Limit and continuity	3	2
9	Show that the limit does not exist of the function: $\lim_{(x,y)\to(0,0)} \frac{2xy}{x^2+y^2}$	3	K3	M	N	Functions of several variables	Limit and continuity	3	6
10	Show that the limit does not exist of the function: $\lim_{(x,y)\to(0,0)} \frac{xy^2}{x^2+y^4}$	3	K3	M	N	Functions of several variables	Limit and continuity	3	6

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11	Show that the limit does not exist of the function: $\lim_{(x,y)\to(1,-1)} \frac{xy+1}{x^2-y^2}$	3	K3	M	N	Functions of several variables	Limit and continuity	3	6
12	Define the continuity of a function $f(x,y)$ at a point (x_0,y_0).	3	K1	M	N	Functions of several variables	Limit and continuity	3	2
13	$f(x,y)=\sin(x+y)$ At what points (x, y) in the plane is the function continuous:	3	K2	M	N	Functions of several variables	Limit and continuity	3	2
14	At what points (x, y) in the plane is the function continuous: $f(x,y)=\ln(x^2+y^2)$	3	K2	M	N	Functions of several variables	Limit and continuity	3	2
15	Show that the function is continuous at every point except the origin: $f(x,y)=\begin{cases}\frac{x^2}{x^2+y^2}, & (x,y)\neq(0,0)\\ 0, & (x,y)=(0,0)\end{cases}$	3	K3	M	N	Functions of several variables	Limit and continuity	3	6
16	Show that the function is continuous at every point except the origin: $f(x,y)=\begin{cases}\frac{3x^2y}{x^4+y^4}, & (x,y)\neq(0,0)\\ 0, & (x,y)=(0,0)\end{cases}$	3	K3	M	N	Functions of several variables	Limit and continuity	3	6
17	Define the partial derivative of a function $f(x, y)$ with respect to x at a point (x_0, y_0).	3	K1	M	N	Differentiation of Functions of several variables	Partial derivatives	3	2
18	Define the partial derivative of a function $f(x, y)$ with respect to y at a point (x_0, y_0).	3	K1	M	N	Differentiation of Functions of several variables	Partial derivatives	3	2
19	Find the partial derivative of the function with respect to each variable: $f(x, y)=2x^2-3y-4$	3	K3	M	N	Differentiation of FSV	Partial derivatives	3	2

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20	Find the partial derivative of the function with respect to each variable: $f(x,y)=(x+y)(xy-1)$	3	K3	M	N	Differentiation of FSV	Partial derivatives	3	6
21	Find the partial derivative of the function with respect to each variable: $f(x, y)=\sqrt{(x^2 + y^2)}$	3	K3	H	N	Differentiation of FSV	Partial derivatives	3	6
22	Find the partial derivative of the function with respect to each variable: $f(x, y)=tan^{-1}(y/x)$	3	K3	H	N	Differentiation of FSV	Partial derivatives	3	6
23	Find all the second-order partial derivatives of the function: $f(x, y)=(x+y+xy)$	3	K3	M	N	Differentiation of FSV	Partial derivatives	3	6
24	Find all the second-order partial derivatives of the function $z=x^2 tan(xy)$	3	K3	H	N	Differentiation of FSV	Partial derivatives	3	6
25	Find the value of $\frac{\partial z}{\partial x}$ at the point (1, 1, 1) if the equation $xy + z^3x - 2yz = 0$ defines z as a function of the two independent variables x and y and the partial derivative exists.	3	K3	H	N	Differentiation of FSV	Partial derivatives	3	6
26	Define total derivatives of function of two variables.	3	K1	M	N	Differentiation of FSV	Partial derivatives	3	2
27	Define total derivatives of function of three variables.	3	K1	M	N	Differentiation of FSV	Partial derivatives	3	2
28	Find the total differential of the function at the point $(1,1)$: $f(x,y)=x^3y^4$	3	K3	L	N	Differentiation of FSV	Partial derivatives	3	6
29	Find the total differential of the function at the point $(1,0,0)$: $f(x,y,z)=\sqrt{(x^2 + y^2 + z^2)}$	3	K3	M	N	Differentiation of FSV	Partial derivatives	3	6
30	Draw a branch diagram and write a Chain Rule for derivative of a function of 1 independent variable and 2 intermediate variables.	3	K2	M	N	Differentiation of FSV	Chain rule	3	2

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31	Draw a branch diagram and write a Chain Rule for derivative of a function of 1 independent variable and 3 intermediate variables.	3	K2	M	N	Differentiation of FSV	Chain rule	3	2
32	Draw a branch diagram and write a Chain Rule for derivative of a function of 2 independent variables and 3 intermediate variables.	3	K2	M	N	Differentiation of FSV	Chain rule	3	2
33	Express $\frac{dy}{dx}$ as a function of *t*, both by using the Chain Rule and by expressing *w* in terms of *t* and differentiating directly with respect to *t*. Then evaluate $\frac{dy}{dx}$ at $t = \pi$: $w = x^2 + y^2,\ x = cost,$ $y = sint, t = \pi.$	3	K3	M	N	Differentiation of FSV	Chain rule	3	6
34	Evaluate$\frac{dw}{du}$ and $\frac{dw}{dv}$ at the point (*u*, v): $w = 4e^x lny,$ $x = ln(ucosv),$ $y = usinv; (u, v) = \left(2, \frac{\pi}{4}\right)$	3	K3	M	N	Differentiation of FSV	Chain rule	3	6
35	Evaluate$\frac{dw}{du}$ and $\frac{dw}{dv}$ at the point$(u, v) = \left(\frac{1}{2}, 1\right)$: $w = xy + yz + xz,$ $x = u + v, y = u - v,$ $z = uv.$	3	K3	M	N	Differentiation of FSV	Chain rule	3	6
36	Express $\partial w/\partial r$ and $\partial w/\partial s$ in terms of *r* and *s* if $w = x + 2y + z^2, x = \frac{r}{s},$ $y = r^2 + lns, z = 2r.$	3	K3	M	N	Differentiation of FSV	Chain rule	3	6
37	Express $\partial w/\partial r$ and $\partial w/\partial s$ in terms of *r* and *s* if $w = x^2 + y^2, x = r - s,$ $y = r - s.$	3	K3	M	N	Differentiation of FSV	Chain rule	3	6
38	If $f(u, v, w)$ is differentiable and $u = x - y$, $v = y - z$, and $w = z - x$, show that $\frac{\partial f}{\partial x} + \frac{\partial f}{\partial y} + \frac{\partial f}{\partial z} = 0$.	3	K3	H	N	Differentiation of FSV	Chain rule	3	6

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39	Show that if $w = f(u, v)$ satisfies the Laplace equation $f_{uu} + f_{vv} = 0$ and if $u = (x^2 - y^2)/2$ and $v = xy$, then w satisfies the Laplace equation $w_{xx} + w_{yy} = 0$.	3	K3	M	N	Differentiation of FSV	Chain rule	3	10
40	Find dy/dx if $y^2 - x^2 - sinxy = 0$	3	K3	M	N	Differentiation of FSV	Chain rule	3	6
41	Find dy/dx if $xe^y + sinxy + y - ln2 = 0$	3	K3	M	N	Differentiation of FSV	Chain rule	3	6

Signature of Course Coordinator/DC:

Signature of Dean:

IQAC