UNITED COLLEGE OF ENGINEERING & RESEARCH	DEPARTMENT OF APPLIED SCIENCES & HUMANITIES		
I Sessional Exam	Semester : I	Section: A to M	Date: 16.01.21
Time: 2hrs	Subject: Maths	Paper code: KAS-103	MM: 30

READ ALL INSTRUCTIONS AND QUESTIONS CAREFULLY — Marks

SECTION A (Attempt all questions)

			[6]	CO	BL
1	a	If $y=x^2e^{2x}$ determine $y_n(0)$.	1	2	L3
1	b	If $z = x^y$ find $\frac{\partial^2 z}{\partial x \partial y}$.	1	3	L2
1	c	Find stationary points of $5x^2 + 10y^2 + 12xy - 4x - 6y + 1$.	1	3	L1
1	d	If $y = x^3 \log x$, show that $y_4 = \frac{6}{x}$.	1	2	L2
1	e	Define homogeneous function. Find degree of $f(x,y) = \frac{x^2y}{x+y}$.	1	3	L1
1	f	If $u = lx + my, v = mx - ly$, then find $\frac{\partial(x,y)}{\partial(u,v)}$	1	3	L2

SECTION B (Attempt any three questions)

		[9]		
2	If $u = sec^{-1}\left(\frac{x^3+y^3}{x+y}\right)$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 2 \cot u$. Also evaluate $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial y \partial x} + y^2\frac{\partial^2 u}{\partial y^2}$.	3	3	L4
3	If $y = e^{a\sin^{-1}x}$, prove that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2+a^2)y_n = 0$. Deduce that $\lim_{x\to 0}\frac{y_{n+2}}{y_n} = n^2 + a^2$.	3	2	L3
4	The torsional rigidity of a length of a wire is obtained from the formula $N= \frac{8\pi IL}{t^2r^4}$. If L is decreased by 2%, r increased by 2%, t increased by 1.5%, show that the value of N is diminished by 13% approximately.	3	3	L2
5	If $u = f(r)$, where $r^2 = x^2 + y^2$ prove that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = f''(r) + \frac{1}{r}f'(r)$	3	3	L2

SECTION C (Attempt any three questions)

		[15		
6	Expand $e^x \tan^{-1} y$ in powers of $(x-2)$ and $(y-1)$ up to the terms of degree 2.	5	3	L2
7	Use Jacobian to show that the functions $u = y + z, v = x + 2z^2$, $w = x - 2y^2 - 4yz$ are not independent of one another. Find the relation between them.	5	3	L3
8	If $y = (\sin^{-1} x)^2$ then show that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - n^2y_n = 0$ and hence calculate y_n, when x=0.	5	2	L3
9	Find the maximum and minimum distance of the point (1,2,-1) from the sphere $x^2 + y^2 + z^2 = 24$	5	3	L3

END OF PAPER

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