Total No. of Questions – [4] Total No. of Printed Pages: 3

G.R./PRN No.	

PAPER CODE	U123-201B (REGULAR)

MAY 2023 (INSEM+ ENDSEM) EXAM

F.Y. B. TECH. (SEMESTER - II)

COURSE NAME: CALCULUS

COURSE CODE: ES10201B

(PATTERN 2020)

Time: [2Hr] [Max. Marks: 60]

(*) Instructions to candidates:

1) **Figures to the right indicate full marks.**
2) **Use of scientific calculator is allowed**
3) **Use suitable data where ever required**

Question No.	Question Description	Marks	CO mapped	Blooms Taxonomy Level
Q.1	**Solve the following**			
	i) If $u = log(x^2 + y^2) + tan^{-1}\left(\frac{y}{x}\right)$ then the value of $\frac{\partial u}{\partial y} =$ A) $\frac{2x+y}{x^2+y^2}$ B) $\frac{2x-y}{x^2+y^2}$ C) $\frac{2y-x}{x^2+y^2}$ D) $\frac{2y+x}{x^2+y^2}$	[2]	1	R, U, A
	ii) If $ux + vy = 0$; $\frac{u}{x} + \frac{v}{y} = 1$ then the value of $\left(\frac{\partial v}{\partial y}\right)_x =$ A) $\frac{x^2(x^2-y^2)}{(x^2+y^2)^2}$ B) $\frac{y^2(x^2-y^2)}{(x^2+y^2)^2}$ C) $\frac{x^2(x^2+y^2)}{(x^2+y^2)^2}$ D) $\frac{y^2(x^2+y^2)}{(x^2+y^2)^2}$	[2]	1	R, U, A
	iii) If $u = cot^{-1}\left(\frac{x^2+y^2}{x-y}\right)$ then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} =$ A) $-\tan 2u$ B) $-\sin 2u$ C) $-\cos 2u$ D) $-\sec 2u$	[2]	1	R, U, A
	iv) If u $= log(x^2 + y^2 + z^2)$ then $u_{xx} + u_{yy} + u_{zz} =$ A) $\frac{2}{x^2+y^2+z^2}$ B) $\frac{1}{x^2+y^2+z^2}$ C) 0 D) 1	[2]	1	R, U, A
	v) If $u = \tan^{-1}\left(\frac{x^3+y^3}{x+y}\right)$ then $x^2u_{xx} + 2xyu_{xy} + y^2u_{yy} =$ A) $(\cos 2u)(1 + 4sin^2u)$ B) $(\cos 2u)(1 - 4sin^2u)$ C) $(\sin 2u)(1 + 4sin^2u)$ D) $(\sin 2u)(1 - 4sin^2u)$	[2]	1	R, U, A
	vi) If $x = e^u \sec v$, $y = e^u \tan v$ then, $\frac{\partial(u,v)}{\partial(x,y)} =$ A) $e^u \sec v$ B) $e^{-u} \sec v$ C) $e^{2u} \sec v$ D) $e^{-2u} \sec v$	[2]	2	R, U, A

vii) If $u = 2xy$, $v = x^2 - y^2$ where $x = r\cos\theta$, $y = r\sin\theta$ then, $\frac{\partial(r,\theta)}{\partial(u,v)} =$ A) $-4r^3$ B) $-\frac{1}{4r^3}$ C) $-4r^2$ D) $-\frac{1}{4r^2}$	[2]	2	R, U, A
viii) If $f(x,y) = x^3 + xy^2 + 21x - 12x^2 - 2y^2$ then the minimum value occurs at A) (7,0) B) (6,0) C) (1,0) D) (2,0)	[2]	2	R, U, A
ix) If $f(x,y,z) = xy^2z^3$ and $x + y + z = 24$ then $x =$ maximum value of their product is A) 2 B) 4 C) 6 D) 8	[2]	2	R, U, A
x) If there is an error of 1% while measuring the base radius and error of 2% while measuring the height of a right circular cylinder, then the % error in the volume of the cylinder is A) 1% B) 2% C) 3% D) 4%	[2]	2	R, U, A
xi) $\int_0^{\pi} sin^7x\,dx =$ A) 0 B) $\frac{32\pi}{35}$ C) $\frac{32}{35}$ D) $\frac{35}{32}$	[2]	3	R, U, A
xii) $\int_{-\pi}^{\pi} sin^2x cos^3x\,dx =$ A) 0 B) $\frac{\pi}{2}$ C) $\frac{\pi}{4}$ D) None of these	[2]	3	R, U, A
xiii) $\int_0^{\infty} e^{-2x}\sqrt{x}\,dx =$ A) $\frac{\sqrt{\pi}}{2\sqrt{2}}$ B) $\frac{\sqrt{\pi}}{4\sqrt{2}}$ C) $\frac{\sqrt{\pi}}{\sqrt{2}}$ D) $\frac{\sqrt{\pi}}{3\sqrt{2}}$	[2]	3	R, U, A
xiv) $\int_0^1 x^5(1-\sqrt{x})^7\,dx =$ A) B(8,4) B) 2B(8,4) C) 2B(12,8) D)B(8,12)	[2]	3	R, U, A
xv)The value of a_1 in the Fourier series of $f(x) = \pi x$ in $0 \le x \le 2\pi$ is A) 0 B) -1 C) $\frac{-1}{2}$ D) -2	[2]	3	R, U, A

Q2	**Solve any two out of three**			
	a) Solve: $\frac{dy}{dx} = \frac{\tan y - 2xy - y}{x^2 - x\tan^2 y + \sec^2 y}$	[5]	4	R, U, A
	b) Solve: $\frac{dy}{dx} = \frac{y^3}{e^{2x+y^2}}$.	[5]	4	R, U, A
	c) If the temperature of a body drops from 100^oC to 88^oC in 10 minutes, when the temperature of the surrounding is 25^oC. What will the temperature after 20 minutes.	[5]	4	R, U, A
Q.3	**Solve any two out of three**			
	a) Trace the curve: $xy^2 = a(x^2 - a^2)$	[5]	5	R, U, A
	b) Trace the curve: $r = a(1 + \cos\theta)$	[5]	5	R, U, A
	c) Find length of the tractrix: $x = a\left(\cos t + \frac{1}{2}\log\tan^2\frac{t}{2}\right)$; $y = a\sin t$ from $\frac{\pi}{2}$ to any point t	[5]	5	R, U, A
Q.4	**Solve any two out of three**			
	a) Evaluate: $\iint_R x^3\, y dx dy$ over the positive quadrant of the ellipse: $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$	[5]	6	R, U, A
	b) Evaluate: $\int\int\int x^2y^2z\, dxdydz$ over the tetrahedron formed by $x = 0$, $y = 0$, $z = 0$ and $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$	[5]	6	R, U, A
	c) Find the area between the curve, $y^2(x - a) = a^2(2a - x)$ and its asymptote.	[5]	6	R, U, A