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

G.R./PRN No.	

PAPER CODE	U113-201B(BE)

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	*i*) $z = \sin\left(\frac{x^2+y^2}{x+y}\right)$ is a a) homogeneous function b) Non – homogeneous function c) homogeneous function of degree 0 d) Homogeneous function of degree 1	[2]	1	R,U,A
	ii)If $u = \tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$ then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$ is a) sin u b) cos u c) cos(2u) d) sin(2u)	[2]	1	R,U,A
	iii)If $x = u\tan v, y = u\sec v$ then the value of $\left(\frac{\partial v}{\partial x}\right)_y$ is a) u b) 1 c) $\frac{1}{u}$ d) $\frac{-1}{u}$	[2]	1	R,U,A
	iv)*If* $u = sin^{-1}\sqrt{x^2+y^2}$ then the value of $x^2u_{xx} + 2xyu_{xy} + y^2u_{yy}$ *is* a) tanu b) tan^2u c) – tanu d)tan^3u	[2]	1	R,U,A
	v)u = f(r) and $r = \sqrt{x^2+y^2}$ then $\frac{\partial u}{\partial x}$ is a) f'(r)x b)f'(r)$\frac{x}{r}$ c)$f'(r)\frac{y}{r}$ d)$f'(r)\frac{1}{r}$	[2]	1	R,U,A

	vi) Find percentage error in area of an ellipse when an error of 1% is made in both major and minor axes a) 1% b) 0% c) 2% d) -1%	[2]	2	R,U,A
	vii) $u = \frac{x^2-y^2}{x^2+y^2}, v = \frac{2xy}{x^2+y^2}$ *If* $JJ' = 0$ then Relation between u and v is a) $u^2+v^2=1$ b) $u^2-v^2=1$ c) $u^2/v^2=1$ d) $u^2v^2=1$	[2]	2	R,U,A
	viii) $f(x,y) = x^2+y^2+6x+12$) then the minimum value of f at $(-3,0)$ *is* a) 2 b) 3 c) -3 d) -2	[2]	2	R,U,A
	ix) Stationary value of $f(x,y) = xy + a^3\left(\frac{1}{x}+\frac{1}{y}\right), x>0\ y>0$ is *a)* $(-a,-a)$ *b)* (a,a) *c)* $(a,-a)$ *d)* $(-a,a)$	[2]	2	R,U,A
	x) If $x = r\cos\theta$ and $y = r\sin\theta$ then $\frac{\partial(x,y)}{\partial(r,\theta)}$ *is* a) r^2 b) $-r$ c) r d) $\frac{1}{r}$	[2]	2	R,U,A
	xi) For the function $f(x) = \sin x$, in the interval $(0,2\pi)$ the value of a_0 is a) $\frac{1}{\pi}$ b) 0 c) 2π d) $\frac{2}{\pi}$	[2]	3	R,U,A
	xii) The value of $\int_0^\infty \frac{x^5}{5^x}\,dx$ *is* *a)* $\frac{120}{(\log 5)^6}$ *b)* $\frac{120}{(\log 6)^6}$ *c)* $\frac{24}{(\log 5)^4}$ d) None of these	[2]	3	R,U,A
	xiii) The value of $\int_0^1 \frac{dx}{\sqrt{1-x^4}}$ is (a) $\frac{1}{2}\beta\left(\frac{1}{4},\frac{1}{2}\right)$ (b) $2\beta\left(\frac{5}{4},\frac{1}{4}\right)$ c) $2\beta\left(\frac{1}{4},\frac{1}{2}\right)$ (d) None of these	[2]	3	R,U,A
	xiv) The value of $\int_0^{\frac{\pi}{2}} \frac{dx}{\sqrt{\sin x}} \int_0^{\frac{\pi}{2}} \sqrt{\sin x}\,dx$ is *a)* 1 *b)* π *c)* $\frac{\pi}{2}$ *d)* 0	[2]	3	R,U,A
	xv) The value of $\int_0^{\frac{\pi}{4}} \sin^7 2\theta\ d\theta$ *is* *a)* $\frac{3}{35}$ b) $\frac{3\pi}{70}$ *c)* $\frac{8}{35}$ d) $\frac{3\pi}{120}$	[2]	3	R,U,A
Q2	**Solve any two out of three**			
	a) $(1+\log(xy))dx + \left(1+\frac{x}{y}\right)dy = 0$	[5]	4	R,U,A
	b) $\tan y \frac{dy}{dx} + \tan x = \cos y \cos^3 x$	[5]	4	R,U,A
	c) Find Orthogonal Trajectory for $r = a(1-\cos\theta)$	[5]	4	R,U,A

Q.3	**Solve any two out of three** *a)* $y^2(a^2 - x^2) = a^3x$ *b)* $r = a\cos 2\theta$ *c)* $x = a(t - sint), y = a(1 - cost)$	 [5] [5] [5]	 5 5 5	 R,U,A R,U,A R,U,A
Q.4	**Solve any two out of three** *a)* Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} e^{-(x^2+y^2)}\, dx\, dy$ *b)* Evaluate $\int_0^1 \int_0^{1-x} \int_0^{x+y} e^y dx\, dy\, dz$ c) Find area bounded by the curves $y^2 = 4x$ *and line* $2x - 3y + 4 = 0$	 [5] [5] [5]	 6 6 6	 R,U,A R,U,A R,U,A