Total No. of Questions – [4] Total No. of Printed Pages: 03

G.R. No.	

PAPER CODE	U112-201B(BE)

DEC 2022 (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**

Q.1 i) 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 [2]

a) sin u b) cos u c) cos(2u) d) sin(2u)

ii) $u = \frac{\sqrt{x}+\sqrt{y}}{\sqrt[3]{x}+\sqrt[3]{y}}$ then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$ is [2]

a) 6 u b) -6u c) $\frac{1}{6}$ d) $\frac{1}{6}u$

iii) $u = \tan^{-1}\left(\frac{x}{y}\right)$ then $\frac{\partial u}{\partial x}$ is [2]

a) $\frac{y}{x^2+y^2}$ b) $\frac{x}{x^2+y^2}$ c) $\frac{2x}{x^2+y^2}$ d) $\frac{2y}{x^2+y^2}$

iv) If $u = x^y$ then $\frac{\partial u}{\partial y}$ is [2]

a) $x^{y-1} \log x$ b) $y\, x^{y-1}$ c) $x^y \log x$ d) $x^y \log y$

v) If $u = \log\left(\frac{x^3+y^3}{x^2+y^2}\right)$ then e^u is homogeneous function of degree [2]

a) 0 b) 1 c) 2 d) -2

vi) Area of an triangle is $\Delta = \frac{1}{2}bc\sin A$ If $A = \frac{\pi}{4}$, & errors in b, c, and A is 1% , 2%, and 3% , Then % error in area is [2]

a) $\frac{3\pi}{4}$ b) $3 + \frac{3\pi}{4}$ c) $2+\frac{3\pi}{4}$ d) $3 + \frac{\pi}{2}$

vii) If $rt - s^2 > 0$ and $r < 0$ at (a,b) then function has [2]

a) Maxima at (a,b)
b) Minima at (a,b)
c) The case is undecided
d) Saddle point at (a,b)

viii) If $f(x,y) = xy\,(a - x - y)$ then stationary points are [2]

a) (0,0) and (a,a)
b) (0,0) and $\left(\frac{a}{3},\frac{a}{3}\right)$
c) (0,0) , (a,0) , (0,a) and $\left(\frac{a}{3},\frac{a}{3}\right)$
d) ~~(0,0) and $\left(\frac{-a}{3},\frac{-a}{3}\right)$~~

ix) If $x = r\cos\theta$ *and* $y = r\sin\theta$ then $\frac{\partial(r,\theta)}{\partial(x,y)}$ is [2]

a) r^2 b) $-r$ c) r d) $\frac{1}{r}$

x) If $f(x,y) = x^4 + y^4 - 2(x-y)^2$ then minimum value at $(-\sqrt{2},\sqrt{2})$ is [2]

a) 8 b) 4 c) -4 d) -8

xi) For the function f (x) = x in the interval $-\pi < x < \pi$ the values of a_n and b_n are [2]

(a) $\frac{(-1)^n}{\pi}$, 0 (b) $\frac{-2(-1)^n}{n\pi}, \frac{(-1)^n}{n\pi}$ (c) $0, \frac{-2(-1)^n}{n}$ (d) None of these

xii) The value of $\int_0^1 \frac{dx}{\sqrt{-\log x}}$ is [2]

(a) $\frac{\sqrt{\pi}}{3}$ (b) $\sqrt{2\pi}$ (c) $\sqrt{\pi}$ (d) None of thèse

xiii) The value of $\int_0^{\frac{\pi}{2}} \frac{d\theta}{\sqrt{\sin\theta}} \cdot \int_0^{\frac{\pi}{2}} \sqrt{\sin\theta\, d\theta}$ is [2]

(a) 1 (b) π (c) $\frac{\pi}{2}$ (d) 0

xiv) The value of $\int_0^{\infty} x^7 e^{-2x^2}\, dx$ is [2]

(a) $\frac{\sqrt{\pi}}{16}$ (b) $\sqrt{2\pi}$ (c) $\frac{3}{16}$ (d) $120\sqrt{\pi}$

xv) The value of integral $\int_0^{\pi} x\sin^7 x.\cos^4 x dx$ is

(a) $\frac{16\pi}{35}$ (b) $\frac{15\pi}{815}$ (c) $\frac{8\pi}{315}$ (d) None of thèse [2]

Q2 **Solve any two out of three**

a) $\frac{dy}{dx} = \frac{tany-2xy-y}{x^2-xtan^2y+sec^2y}$ [5]

b) $\frac{dy}{dx} - y\ tanx = y^4 \sec x$ [5]

c) A body originally at 80°C cools down to 60°C in 20 minutes , the temperature of the air being 40°C What will be the temperature of the body after 40 minutes from the original ? [5]

Q.3 **Solve any two out of three**

Trace the following curves.

a) $y^2(x^2 - 1) = x.$ [5]

b) $r = a \cos 2\theta.$ [5]

c) $x = a \cos^3 t\ , y = a \sin^3 t.$ [5]

Q.4 **Solve any two out of three**

a) Evaluate $\iint dx\, dy,$ where R is the region bounded by $x^2 = y$ and $y^2 = x$. [5]

b) Evalute $\int_0^1 \int_0^{1-x} (x + y)dy\, dx$ [5]

c) Evaluate $\int_0^1 \int_0^1 \int_0^1 e^{x+y+z}\ dx\ dy\ dz$ [5]