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

G.R. No.	

PAPER CODE	U112-2018/RE-Backlog

DECEMBER 2021 (INSEM+ ENDSEM) EXAM

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

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) $sinu$ 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) $12u$ b) $-12u$ c) $\frac{1}{12}$ d) $\frac{1}{12}u$

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) $x^{y-1}\,logx$ b) $y\,x^{y-1}$ c) $x^y logx$ d) $x^y logy$

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

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

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

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

[2]

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

$(a)\ 8 \quad (b)\ 4 \quad (c)\ -4 \quad (d)\ -8$

[2]

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

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

x) 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 $\left(\frac{-a}{3}, \frac{-a}{3}\right)$

[2]

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

(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 $\int_0^{\pi/2} \frac{d\theta}{\sqrt{\sin\theta}} \cdot \int_0^{\pi/2} \sqrt{\sin\theta}\, d\theta$ 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 $\int_0^{\pi/2} \pi \sin^7 x \cos^4 x\, dx$ is [2]

(a) $\frac{16\pi}{35}$ (b) $\frac{15\pi}{42}$ (c) $\frac{16\pi}{1155}$ (d) None of these

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**

a) Trace the curve $x(x^2+y^2) = a\,(x^2-y^2)$, *where* $a > 0$ [5]

b) Trace the curve $r = a\cos(2\theta)$ [5]

c) Trace the curve $x = acos^3\theta$, $y = a\,sin^3\theta$ [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) show that $\int_0^a \int_0^{\sqrt{a^2-x^2}} e^{-x^2-y^2}\,dx\,dy = \frac{\pi}{4}(1-e^{-a^2})$ [5]