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

G.R. No.	

PAPER CODE	U111-2018 (RE)

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 **Solve the following**

i) If $f(x,y) = \frac{\sin(xy^2+y)}{x^2+1}$ then the value of $\frac{\partial f}{\partial y} =$ [2]

A) 0 B) 1 C) -1 D) ∞

ii) If $z^3 - zx - y = 3$ then the value of $\frac{\partial z}{\partial x} =$ [2]

A) $\frac{z}{3z^2+1}$ B) $\frac{z}{3z^2-1}$ C) $\frac{1}{3z^2+1}$ D) $\frac{1}{3z^2-1}$

iii) If $u = \log(x^2 + y^2)$ then ... [2]

A) $u_{xy} = u_{yx}$ B) $u_{xy} = \frac{1}{u_{yx}}$

C) $u_{xy} = -u_{yx}$ D) $u_{xy} = 1 + u_{yx}$

iv) If $u = \sin^{-1}(x^2 + y^2 + z^2)$ then $xu_x + yu_y + zu_z =$ [2]

A) $2\cos u$ B) $2\sin u$ C) $2\cot u$ D) $2\tan u$

v) If $x = u\cos v$, $y = u\sin v$ then, $\frac{\partial(x,y)}{\partial(u,v)} =$ [2]

A) u B) $\frac{1}{u}$ C) u^2 D) $\frac{1}{u^2}$

vi) If $x = e^u\cos v$, $y = e^u\sin v$ then, $\frac{\partial(x,y)}{\partial(u,v)} \cdot \frac{\partial(u,v)}{\partial(x,y)} =$ [2]

A) 0 B) 1 C) 2 D) 3

vii) If $u = 2xy$, $v = x^2 - y^2$ where $x = r\cos\theta$, $y = r\sin\theta$ [2]
then, $\frac{\partial(u,v)}{\partial(r,\theta)} =$

A) $-4r^2$ B) $-\frac{1}{4r^2}$ C) $-4r^3$ D) $-\frac{1}{4r^3}$

viii) If $f(x,y) = x^3y^2(12 - x - y)$ then the maximum value occurs at [2]

A) (4,6) B) $(-4,-6)$ C) $(-6,-4)$ D) (6,4)

ix) If $f(x,y) = xy + a^3\left(\frac{1}{x} + \frac{1}{y}\right)$ then the stationary points are: [2]

A) $(-a,-a)$ B) (a,a) C) $(-a,a)$ D) $(a,-a)$

x) If there is an error of 1% while measuring both major and minor axes, then the % error in the area of an ellipse is [2]

A) 2% B) 4% C) 6% D) 8%

xi) $\int_0^{\pi} sin^7 x\, dx =$ [2]

A) 0 B) $\frac{32\pi}{35}$ C) $\frac{32}{35}$ D) $\frac{35}{32}$

xii) $\int_{-\pi}^{\pi} sin^4 x cos^2 x\, dx =$ [2]

A) $\frac{\pi}{2}$ B) $\frac{\pi}{4}$ C) $\frac{\pi}{6}$ D) $\frac{\pi}{8}$

xiii) $\Gamma(3.5) =$ [2]

A) $\frac{15\pi}{8}$ B) $\frac{15\sqrt{\pi}}{8}$ C) $\frac{35\pi}{4}$ D) $\frac{35\sqrt{\pi}}{4}$

xiv) $\int_0^1 x^{-3/4}(1-x)^{-1/4}\, dx =$ [2]

A) $\frac{\pi}{2}$ B) $\frac{\pi}{4}$ C) $\frac{\pi}{6}$ D) $\frac{\pi}{8}$

xv) The value of a_0 in the Fourier series of $f(x) = x \sin x$ in $0 < x < 2\pi$ is [2]

A) 0 B) 1 C) 2 D) -2

Q.2 **Solve any two out of three**

a) Solve: $\frac{dy}{dx} = \frac{5-3x-2y}{2x+3y-5}$ [5]

b) Solve: $\frac{dz}{dx} + \frac{z}{x}\log z = \frac{z}{x^2}(\log x)^2$ [5]

c) If the temperature of a body drops from 100^oC to 60^oC in one minute when the temperature of the surrounding is 20^oC. What will be the temperature at the end of the second minute? [5]

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

a) Trace the curve: $y^2(x-a) = a^2(2a-x)$ [5]

b) Trace the curve: $r = a(1 + cos\,\theta)$ [5]

c) Find the whole length of the loop of the curve: [5]
$3y^2 = x(x-1)^2$

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

a) Evaluate: [5]

$$\int_0^1 \int_x^{\sqrt{x}} (x^2 + y^2) dxdy$$

b) Evaluate: [5]

$$\int_0^1 \int_0^{1-x} \int_0^{x+y} e^z \, dxdydz$$

c) Find the total area of the curve, $r = a(1 + cos\,\theta)$ [5]