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

G.R. No.	

PAPER CODE	U111- 201BC(RE9)

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

a) tan u b) 3tanu c) cotu 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) -6 u c) $\frac{1}{6}$ d) $\frac{1}{6}u$

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

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

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

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

vi) The focal length of a mirror is found from the formula $\frac{2}{f} = \frac{1}{v} - \frac{1}{u}$. The percentage error in f if u and v are both error by 2% each.

a) 4% b) -4% c) 2% d) 3% [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
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]

ix) If $x = uv, y = \frac{u}{v}$ then $\frac{\partial(x,y)}{\partial(u,v)}$ is [2]

a) $-\frac{2u}{v}$ b) $-u$ c) $-v$ d) $-\frac{v}{2u}$

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 $\int_0^{\frac{\pi}{2}} \sqrt{tan\theta}\, d\theta$ is [2]

(a) $B\left(\frac{3}{4},\frac{1}{2}\right)$ (b) $B\left(\frac{1}{2},\frac{1}{2}\right)$ (c) $B\left(\frac{1}{4},\frac{1}{2}\right)$ (d) None of these

xiii) The value of $\left\lceil\frac{1}{2}\right.$ is [2]

(a) $\sqrt{\frac{\pi}{2}}$ (b) $\sqrt{\pi}$ (c) $\frac{1}{2}$ (d) $\frac{\sqrt{\pi}}{2}$

xiv) The value of $\int_0^{\infty} x^2 e^{-h^2x^2}$ [2]

(a) $\frac{\sqrt{\pi}}{4h^3}$ (b) $\sqrt{2\pi}$ (c) $\frac{3}{16}$ (d) $120\sqrt{\pi}$

xv) The value of integral $\int_0^{\pi} x\sin^5 x.\cos^4 x dx$ is [2]

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

Q2 **Solve any two out of three**

a) $\frac{2x}{y^3}dx + \left(\frac{y^2-3x^2}{y^4}\right)dy = 0$ [5]

b) $\cos x \frac{dy}{dx} + y\, sinx = \sqrt{y\, secx}$ [5]

c) A body originally at 100°C cools down to 60°C in 5 minutes , the temperature of the air being 20°C What will be the temperature of the body after further interval of 5 minutes? [5]

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

Trace the following curves.

a) $y^2(2a - x) = x^3$, where $a > 0$ [5]

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

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

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

a) Evaluate $\int_0^1 \int_y^{1+y^2} x^2 y \, dx \, dy$ [5]

b) Find area common to the parabolas $x^2 = 4ay$ and $y^2 = 4ax$. [5]

c) Evaluate $\int_0^1 \int_{y^2}^1 \int_0^{1-x} x \, dz \, dx \, dy$ [5]