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

| G.R./PRN No. | | PAPER CODE | U112-201B (Reg) |
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**DECEMBER 2022 (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**

| Question No. | Question Description | Marks | CO mapped | Blooms Taxonom Level |
|---|---|---|---|---|
| Q.1 | i) If $f(x,y)=\frac{\sin(yx^2+y)}{x^2+1}$ then at $y=0$, the value of $\frac{\partial f}{\partial y}=$<br>A) 0 B) 1 C) $-1$ D) $\infty$ | [2] | 1 | R,U,A |
| | ii) If $z^3-zx-y=3$ then the value of $\frac{\partial z}{\partial x}=$<br>A) $\frac{z}{3z^2+x}$ B) $\frac{z}{3z^2-x}$ C) $\frac{1}{3z^2+1}$ D) $\frac{1}{3z^2-1}$ | [2] | 1 | R,U,A |
| | iii) If $u=x^3e^{\left(-\frac{y}{x}\right)}$ then $x^2u_{xx}+2xyu_{xy}+y^2u_{yy}=$<br>A) $3u$ B) $-3u$ C) $6u$ D) $-6u$ | [2] | 1 | R,U,A |
| | iv) If $u=\sin^{-1}(x^2+y^2+z^2)$ then $xu_x+yu_y+zu_z=$<br>A) $2\cos u$ B) $2\sin u$ C) $2\cot u$ D) $2\tan u$ | [2] | 1 | R,U,A |
| | v) If $u=\log(x^2+y^2)$ then ...<br>A) $u_{xy}=u_{yx}$ B) $u_{xy}=\frac{1}{u_{yx}}$<br>C) $u_{xy}=-u_{yx}$ D) $u_{xy}=1+u_{yx}$ | [2] | 1 | R,U,A |
| | vi) If $x=e^u\cos v$, $y=e^u\sin v$ then, $\frac{\partial(x,y)}{\partial(u,v)}\cdot\frac{\partial(u,v)}{\partial(x,y)}=$<br>A) 0 B) 1 C) 2 D) 3 | [2] | 2 | R,U,A |

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| | vii) If $u = 2xy$, $v = x^2 - y^2$ where $x = r\cos\theta$, $y = r\sin\theta$ then, $\frac{\partial(u,v)}{\partial(r,\theta)} =$<br>A) $-4r^2$ B) $-\frac{1}{4r^2}$ C) $-4r^3$ D) $-\frac{1}{4r^3}$ | [2] | 2 | R,U,A |
| | viii) If $f(x,y) = x^3y^2(12 - x - y)$ then the maximum value occurs at<br>A) (4,6) B) $(-4,-6)$ C) $(-6,-4)$ D) (6,4) | [2] | 2 | R,U,A |
| | ix) If $f(x,y) = xy + a^3\left(\frac{1}{x} + \frac{1}{y}\right)$ then the stationary points are:<br>A) $(-a,-a)$ B) $(a,a)$ C) $(-a,a)$ D) $(a,-a)$ | [2] | 2 | R,U,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<br>A) 2% B) 4% C) 6% D) 8% | [2] | 2 | R,U,A |
| | xi) $\int_0^{\pi} \sin^7 x\, dx =$<br>A) 0 B) $\frac{32\pi}{35}$ C) $\frac{32}{35}$ D) $\frac{35}{32}$ | [2] | 3 | R,U,A |
| | xii) $\int_{-\pi}^{\pi} \sin^4 x \cos^2 x\, dx =$<br>A) $\frac{\pi}{2}$ B) $\frac{\pi}{4}$ C) $\frac{\pi}{6}$ D) $\frac{\pi}{8}$ | [2] | 3 | R,U,A |
| | xiii) $\Gamma(3.5) =$<br>A) $\frac{15\pi}{8}$ B) $\frac{15\sqrt{\pi}}{8}$ C) $\frac{35\pi}{4}$ D) $\frac{35\sqrt{\pi}}{4}$ | [2] | 3 | R,U,A |
| | xiv) $\int_0^1 x^{-3/4}(1-x)^{-1/4}\, dx =$<br>A) $\frac{\pi}{2}$ B) $\frac{\pi}{4}$ C) $\frac{\pi}{6}$ D) $\frac{\pi}{8}$ | [2] | 3 | R,U,A |
| | xv) The value of a0 in the Fourier series of $f(x) = x\sin x$ in $0 < x < 2\pi$ is<br>A) 0 B) 1 C) 2 D) $-2$ | [2] | 3 | R,U,A |

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| Q2 | **Solve any two out of three** | | | |
| | a) $(y^2 e^{xy^2} + 4x^3)dx + (2xy\, e^{xy^2} - 3y^2)dy = 0$ | [5] | 4 | R,U,A |
| | b) $(1 + y^2) + (x - e^{-tan^{-1}y})\frac{dy}{dx} = 0$ | [5] | 4 | R,U,A |
| | c) A constant emf E volts is applied to a constant circuit containing a constant resistance R ohms in series and a constant inductance L henries. Then find current at any time t | [5] | 4 | R,U,A |
| Q.3 | **Solve any two out of three** | | | |
| | a) Trace the curve $a^2x^2 = y^3(2a - y)$ | [5] | 5 | R,U,A |
| | b) Trace the curve $r = a\sin 3\theta$ | [5] | 5 | R,U,A |
| | c) Trace the curve $x = a(t - \sin t), y = a(1 - \cos t)$ | [5] | 5 | R,U,A |
| Q.4 | **Solve any two out of three** | | | |
| | a) Evaluate $\int_0^{2\pi}\int_{a\sin\theta}^{a} r\, dr\, d\theta$ | [5] | 6 | R,U,A |
| | b) Evaluate $\int_0^1\int_0^{1-x}\int_0^{x+y} e^y dz\, dy\, dx$ | [5] | 6 | R,U,A |
| | c) Find the volume of the paraboloid $x^2 + y^2 = 4z$ cut off by the plane $z = 4$ | [5] | 6 | R,U,A |