Total No. of Questions – [4]

Total No. of Printed Pages: 03

| PRN No. | |
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| PAPER CODE | U123-2018(REG) |
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# MAY 2023 (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 wherever required**

| Q. No. | Question Description | Marks | CO mapped | BT Level |
|---|---|---|---|---|
| Q.1 | **Solve all the questions.** | | | |
| | 1) $u = \tan^{-1}\left(\frac{y}{x}\right) + \log(x^2+y^2)$ then $\frac{\partial u}{\partial x}$ is<br>a) $\frac{x+2y}{x^2+y^2}$ b) $\frac{-y}{x^2+y^2}$ c) $\frac{2x}{x^2+y^2}$ d) $\frac{2x-y}{x^2+y^2}$ | [2] | CO1 | R,U,A |
| | 2) If $u = \log(x^3+y^3-x^2y-y^2x)$ then value of $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$ is<br>a) $-3u$ b) $\frac{1}{3}$ c) $3u$ d) 3 | [2] | CO1 | R,U,A |
| | 3) If $x^3+y^3 = 3axy$ then $\frac{dy}{dx}$ is<br>a) $\frac{x^2-ay}{y^2+ax}$ b) $\frac{x^2+ay}{ax-y^2}$ c) $\frac{ay-x^2}{ax-y^2}$ d) $\frac{ay-x^2}{y^2-ax}$ | [2] | CO1 | R,U,A |
| | 4) If u $= x\sin\left(\frac{y}{x}\right)$ then $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2}$ is<br>a) 1 b) $-1$ c) 2 d) 0. | [2] | CO1 | R,U,A |

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| | 5) If $x = r\cos\theta, y = r\sin\theta$ then $\left(\frac{\partial r}{\partial x}\right)_y =$<br>a) 1 b) 0 c) $\sin\theta$ d) $\cos\theta$ | [2] | CO1 | R,U,A |
| | 6) Maximum value of $f(x,y) = 1 - x^2 - y^2$ is<br>a) 1 b) 0 c) 2 d) $-1$ | [2] | CO2 | R,U,A |
| | 7) If $u = 2xy, v = x^2 - y^2, x = r\cos\theta, y = r\sin\theta$<br>then $\frac{\partial(u,v)}{\partial(r,\theta)} =$<br>a) $-4r^3$ b) $-\frac{1}{4r^2}$ c) $-4r^2$ d) $-\frac{1}{4r^3}$ | [2] | CO2 | R,U,A |
| | 8) If errors of 2% and 1% respectively are made in height and radius of base of a right circular cylinder then percentage error in calculating the volume of a right circular cone is<br>a) 4% b) 2% c) 3% d) 1% | [2] | CO2 | R,U,A |
| | 9) Stationary point of the function $f(x,y) = xy - x^2 - y^2 - 2x - 2y + 4$ is<br>a) $(-2,-2)$ b) $(0,-2)$ c) $(-2,0)$ d) $(-1,-1)$ | [2] | CO2 | R,U,A |
| | 10) If $u = \frac{y^2}{x}$ and $v = \frac{x^2}{y}$, then $\frac{\partial(x,y)}{\partial(u,v)}$ is<br>a) $-\frac{1}{3}$ b) $-3$ c) 3 d) $\frac{1}{3}$ | [2] | CO2 | R,U,A |
| | 11) If $f(x) = x^2$ defined in the interval $(-\pi,\pi)$ then the value of $a_0$ is<br>a) $\frac{\pi^2}{3}$ b) $\frac{2\pi^2}{3}$ c) 0 d) $\pi^2$ | [2] | CO3 | R,U,A |
| | 12) The value of $\int_0^\infty e^{-x}\sqrt[2]{x^5}dx$ is<br>a) $\frac{\sqrt{\pi}}{8}$ b) $\frac{15\sqrt{\pi}}{8}$ c) 4! d) $\frac{3\sqrt{\pi}}{8}$ | [2] | CO3 | R,U,A |

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| | **13)** Value of $\Gamma\left(\frac{1}{3}\right)\Gamma\left(\frac{2}{3}\right)$ is<br>**a)** $2\sqrt{\pi}$ **b)** $\frac{2\pi}{\sqrt{3}}$ **c)** $\frac{\pi}{\sqrt{3}}$ **d)** $\frac{\pi}{4}$ | [2] | CO3 | R,U,A |
| | **14)** The value of $\int_0^{\pi} \sin^5 x \, dx$ is<br>**a)** $\frac{16\pi}{15}$ **b)** $\frac{16}{15}$ **c)** 0 **d)** $\frac{4}{15}$ | [2] | CO3 | R,U,A |
| | **15)** The value of $\int_0^{\frac{\pi}{2}} \sqrt{\cot\theta} \, d\theta$ is<br>**a)** $\frac{\pi}{2}$ **b)** $\frac{\pi}{\sqrt{2}}$ **c)** $\frac{\sqrt{2}}{\pi}$ **d)** 0 | [2] | CO3 | R,U,A |
| **Q.2** | **Solve <u>any two</u> out of three.**<br>**a)** Solve : $(\sec^2 x + \cos y)\,dx - x \sin y \, dy = 0$<br>**b)** Solve : $\frac{dy}{dx} + \frac{y}{x} = xe^x y^2$.<br>**c)** Find orthogonal trajectory for $y^2 = 4ax$. | [5]<br>[5]<br>[5] | CO4<br>CO4<br>CO4 | R,U,A<br>R,U,A<br>R,U,A |
| **Q.3** | **Solve <u>any two</u> out of three.**<br>a) Trace the curve $y^2(x^2 - 1) = x$<br>b) Trace the curve $x^{2/3} + y^{2/3} = a^{2/3}$<br>c) Trace the curve $r^2 = a^2 \cos 2\theta$ | [5]<br>[5]<br>[5] | CO5<br>CO5<br>CO5 | R,U,A<br>R,U,A<br>R,U,A |
| **Q.4** | **Solve <u>any two</u> out of three.**<br>a) Evaluate $\int_0^1 \int_0^{1-x} (x + y)\,dx\,dy$<br>b) Evaluate $\int_0^1 \int_0^{\pi} \int_0^{\pi} y \sin z \, dx\,dy\,dz$<br>c) Find the total area included between the two parabolas $y^2 = 4ax$ and $x^2 = 4ay$. | [5]<br>[5]<br>[5] | CO6<br>CO6<br>CO6 | R,U,A<br>R,U,A<br>R,U,A |