

QP CODE: D2BMT2402	(Pages: 2)	Reg. No :
		Name :
SECOND SEMESTER FYUGP EXAMINATION, APRIL 2025		
MAJOR COURSE		
MAT2CJ101 : Integral Calculus		
(Credits: 4)		
Time: 2 Hours	Maximum Marks: 70	
Section A		
Answer the following questions. Each carries 3 marks (Ceiling: 24 marks)		
1. Suppose that $\sum_{k=1}^n a_k = 0$ and $\sum_{k=1}^n b_k = 1$. Find the values of	BL2	
1. $\sum_{k=1}^n (a_k + 1)$		
2. $\sum_{k=1}^n (b_k - 1)$		
2. Use the inequality $\cos x \geq 1 - \frac{x^2}{2}$, which holds for all x , to find a lower bound for the value of $\int_0^1 \cos x \, dx$.	BL1	CO1
3. Evaluate $\int x^{\frac{1}{3}} \sin\left(x^{\frac{4}{3}} - 8\right) dx$	BL2	CO1
4. Simplify the expression $e^{\ln \pi x - \ln 2}$.	BL1	CO2
5. Find $\frac{dy}{dx}$ if $y = \frac{\ln x}{1 + \ln x}$	BL2	CO2
6. Compute $\lim_{x \rightarrow \infty} \frac{x - 8x^2}{12x^2 + 5x}$	BL2	CO2
7. Find $\int \ln x \, dx$.	BL2	CO1
8. Evaluate the integral $\int \frac{3 \cos x}{\sqrt{1 + 3 \sin x}} \, dx$.	BL2	CO1
9. Find the area of the region in the first quadrant bounded by the line $y = x$, the line $x = 2$ and the X axis.	BL3	CO3
10. Find the volume of the solid generated by revolving the region bounded by the curve $x = \sqrt{5}y^2$ and the lines $x = 0, y = -1, y = 1$ about the Y -axis.	BL2	CO3
(PTO)		

Section B

Answer the following questions. Each carries 6 marks (Ceiling: 36 Marks)

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| 11. Find the average value of $f(t) = \sin t$ over the interval $[0, 2\pi]$. | BL2 | CO1 |
| 12. Evaluate the integrals:

1. $\int \cos \theta (\tan \theta + \sec \theta) d\theta$
2. $\int \frac{\csc \theta}{\csc \theta - \sin \theta} d\theta$ | BL2 | CO1 |
| 13. Show that if f is continuous, then $\int_0^1 f(x) dx = \int_0^1 f(1-x) dx$. | BL2 | CO1 |
| 14. Find $\frac{dy}{dx}$ if $y = \int_0^{x^2} \cos \sqrt{t} dt$. | BL2 | CO1 |
| 15. Using Method of partial fractions evaluate $\int_4^8 \frac{y dy}{y^2 - 2y - 3}$. | BL2 | CO1 |
| 16. Evaluate the integral $\int_{-1}^0 \frac{6dt}{\sqrt{3 - 2t - t^2}}$. | BL2 | CO2 |
| 17. Find the area of the region enclosed by $y = x^2 - 2$ and $y = 2$. | BL3 | CO3 |
| 18. Let $g(y) = \sqrt{9 - y^2}$ over the interval $y \in [0, 2]$. Find the surface area of the surface generated by revolving the graph of $g(y)$ around the Y -axis. | BL2 | CO3 |

Section C

Answer any one question. Each carries 10 marks (1 x 10 = 10 Marks)

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| 19. a) Show that $\ln ax = \ln a + \ln x$, for any numbers $a > 0$ and $x > 0$.

b) Show that $\ln\left(\frac{a}{x}\right) = \ln a - \ln x$, for any numbers $a > 0$ and $x > 0$.

c) Use the properties of logarithms to simplify the expression:
$3 \ln \sqrt[3]{t^2 - 1} - \ln(t + 1)$. | BL3 | CO2 |
| 20. Find the length of the graph of $x = \frac{y^3}{3} + \frac{1}{4y}$, $1 \leq y \leq 2$. | BL2 | CO3 |

CO : Course Outcome

BL : Bloom's Taxonomy Levels (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)