



K21U 3468

Reg. No. :

Name :



II Semester B.Sc. Degree (CBCSS – OBE – Reg./Sup./Imp.)
Examination, April 2021

(2019 Admission Onwards)

CORE COURSE IN MATHEMATICS

2B02 MAT : Integral Calculus and Logic

Time : 3 Hours

Max. Marks : 48

PART – A

Short answer questions. Answer **any 4**.

1. Find $\int \frac{1}{\sqrt{4+x^2}} dx$ in terms of hyperbolic functions.
2. Convert the equation $r = \sec \theta$ in to cartesian form.
3. State Fubini's theorem (first form).
4. Write the contrapositive of the statement : $x > y \Rightarrow x^2 > y^2$.
5. If P and Q are two statements, when will be the statement $\neg(P \vee Q)$ true? (4x1=4)

PART – B

Short essay questions – Answer **any 8**.

6. Evaluate $\int_0^{\frac{\sqrt{\pi}}{2}} x \cos^5(2x^2) dx$.
7. Evaluate $\int e^x \sinh 2x dx$.
8. Express the Cartesian coordinates (x, y, z) in terms of the cylindrical coordinates (r, θ , z).
9. Evaluate $\iint_R \cos \theta dr d\theta$, where R is : $0 \leq \theta \leq \frac{\pi}{2}$; $0 \leq r \leq 3$.

P.T.O.



10. Plot the domain of integration of the integral $\int_0^1 \int_{1-x}^{1+x} f(x, y) dy dx$.

11. Find $\int_0^{\frac{\pi}{2}} \sin x dx$ using trapezoidal rule, taking two sub-intervals.

12. Find $\int_0^4 f(x) dx$ using Simpson's 1/3 rule, where the function $f(x)$ is given by

x	0	1	2	3	4
f(x)	0	1	8	27	64

13. If x is an odd integer, prove that $x^2 + 2$ is odd.

14. Define the terms :

- i) tautology
- ii) negation of a statement.

15. State the two De Morgan's laws for quantified statements.

16. If $p(x) : x$ is an integer multiple of 2 and $q(x) : x$ is an integer multiple of 3, what is the statement corresponding to $\neg(p(x) \wedge q(x))$? (8×2=16)

PART – C

Essay questions – Answer **any 4**.

17. Derive reduction formula for $\int \sec^n x dx, n > 2$.

18. Show that $\frac{d}{dx}(\tanh^{-1} x) = \frac{d}{dx}(\coth^{-1} x)$.

19. Express the integral in Cartesian form (no need to evaluate) $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \int_0^{\sec \theta} r^3 dr d\theta$.



20. Evaluate $\int \int_A dx dy$, where A is the region in the first quadrant bounded by the curve $xy = 16$ and the lines $y = x$, $y = 0$, $x = 6$.

21. Using trapezoidal rule, find the approximate area bounded between the parabola $y = 4 - x^2$ and the X axis, using 8 sub-intervals.

22. Prove the following statement using the method of contradiction : "If n is an integer and n^2 is even, then n must be even". Is the converse true ? Justify.

23. Write the negation of the statements using quantifiers :

i) $(\forall x \in \mathbb{R}) (x^2 + 4x < 7)$

ii) $(\exists x \in \mathbb{R}) (x^2 + 4x > 7)$.

(4x4=16)

PART – D

Long Essay Questions – Answer any 2.

24. Find the following integrals :

i) $\int_1^2 \frac{1}{x \sqrt{9 + (\ln x)^2}} dx$

ii) $\int \frac{\cosh^{-1} x}{\sqrt{x^2 - 1}} dx$.

25. Evaluate $\int \int \int_V 2x dz dy dx$, where V is the cylindrical solid $x^2 + y^2 = 4$, cut by the XY plane below and by the plane $x + 2y + z = 9$ above.

26. Find $\int_0^6 \frac{5}{x+2} dx$ using Simpson's 1/3 rule, taking six sub-intervals.

27. i) Explain the three methods of proof.

ii) If $x + a > 0$ for all $a > 0$, prove that $x \geq 0$.

(2x6=12)