Reg. No. :

Name :

II Semester B.Sc. Degree (CBCSS - OBE - Regular/Supplementary/ Improvement) Examination, April 2023 (2019 Admission Onwards) CORE COURSE IN MATHEMATICS

2B02 MAT : Integral Calculus and Logic

Time: 3 Hours

Max. Marks: 48

SECTION - A

Short Answer Questions. Answer any 4.

- 1. Find the value of $\int_0^{\pi/2} \cos^7 x dx$
- 2. Find a polar equation for the circle $(x-2)^2 + y^2 = 4$. What is Tautology?
- 4. Write the principle of double negation.
- 5. Write the contrapositive of the implication "If I am in Chicago, then I am in Illinois".
- $(4 \times 1 = 4)$ SECTION - B

Short Essay Questions. Answer any 8. 6. Show that $\sinh 2x = 2 \sinh x \cosh x$.

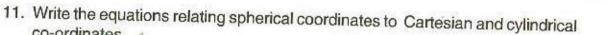
- 7. Evaluate $\int_0^1 x^2 (1-x^2)^{3/2} dx$.
- Evaluate ∫cosec⁵xdx.
- 9. Calculate $\iint_{R} f(x, y) dA$ for $f(x, y) = 100 6x^{2}y$ and $R: 0 \le x \le 2, -1 \le y \le 1$. Graph the sets of points whose polar coordinates satisfy the conditions
- $1 \le r \le 2$ and $0 \le \theta \le \frac{\pi}{2}$.

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 $y = r \sin \theta$.

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- co-ordinates. 12. Find the Jacobian for the polar coordinate transformation $x = r \cos \theta$,
- 13. Find the minimum number of intervals required to evaluate $\int_0^1 \ln(1+x) dx$ using
- Simpson's 1/3 rule with an accuracy of 10-6. 14. Evaluate $\int_0^2 \frac{dx}{x^2 + 2x + 10}$ using Simpson's rule with n = 2.
- 15. Find the truth set T_p of the propositional function p(x) given by "x + 5 > 1", defined on the $P = \{1, 2, 3,...\}$.

16. Negate the statement "All students live in dormitories".

 $(4 \times 4 = 16)$

 $(8 \times 2 = 16)$

SECTION - C

Evaluate ∫₀^{ln2} 4e^x sinh xdx .

Essay Questions. Answer any 4.

Derive the reduction formula for ∫ sinⁿ x dx

 $m \ge 10$ or $n \ge 10$.

an odd integer".

- 20. Evaluate $\int_{0}^{1} \int_{0}^{1-x} \sqrt{x+y} (y-2x)^{2} dy dx$.
- 21. Use truth table to show that $\neg (p \land q) \equiv \neg p \lor \neg q$. 22. If m and n are natural numbers such that $m + n \ge 20$ then show that either

19. Find the area enclosed by the lemniscate $r^2 = 4 \cos 2\theta$

23. Give a direct proof to the theorem "The square of an odd integer is also

integral $\int_0^\infty x^n e^{-x} dx = n!$, where n is any positive integer.

Long Essay Questions. Answer any 2.

24. Obtain a reduction formula for ∫ xⁿ e^{-x} dx and hence show that the improper

25. Using polar integration, find the area of the region R in the xy - plane enclosed by the circle $x^2 + y^2 = 4$, above the line y = 1, and below the line $y = \sqrt{3}x$.

SECTION - D

- 26. Evaluate $\int_0^1 \frac{dx}{3+2x}$ using trapezoidal rule with n = 2. Compare with the exact solution. Also find the number of sub intervals required if the error is to be less than 5×10^{-4} .

27. Prove that there are infinitely many prime numbers.

 $(2 \times 6 = 12)$