QP CODE: 24803759

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Reg No : .....

Name : .....

INTEGRATED MSC DEGREE EXAMINATION, JUNE 2024

Second Semester

INTEGRATED MSC BASIC SCIENCE-STATISTICS

COMPLEMENTARY - IST2CM05 - MATHEMATICS II - INTEGRAL CALCULUS AND TRIGONOMETRY

2020 Admission Onwards

B04B84B8

Time: 3 Hours | Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Evaluate $\int sec^2(3x+2)\,dx$.
2. Define Areas Between Curves.
3. Calculate $\int_0^4 (3x - \frac{x^3}{4})\,dx$.
4. Write the equation of Volume by Disks for Rotation About the x-axis . Also about the y-axis.
5. Write the formula for the area of the surface generated about the x-axis.
6. a) $\int x^n\,dx$= b) $\int \frac{1}{x}\,dx$ =
7. Write the integration by parts formula.
8. State De-Moivre's Theorem.
9. Write the principal value of the inverse cosine and sine of x+iy.
10. Write Geometric Series.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. Find the values of the following
    a) $\sum_{k=4}^{5} \frac{k^2}{k-1}$ b) $\sum_{k=1}^{5} k$
12. Find $\int_0^1 (2e^{-x} + x - \frac{e^x}{2})\,dx$.

13. The region bounded by the curve $y = x^2 + 1$ and the line $y = -x + 3$ is revolved about the x-axis to generate a solid. Find the volume of the solid using washer method.

14. a)Write the formula for Arc Length.
    b) Find the length of the graph of
    $f(x) = \frac{x^3}{12} + \frac{1}{x},\ 1 \le x \le 4$

15. Evaluate $\int_{-2}^{2} \frac{1}{4+x^2}\, dx$.

16. Find A, B, and C in the partial fraction expansion
    $\frac{x^2+1}{(x-1)(x-2)(x-3)} = \frac{A}{x-1} + \frac{B}{x-2} + \frac{C}{x-3}$

17. Express the quantity $-1 - i$ in the form $r(cos\theta + isin\theta)$

18. Show that $sinh(x + y) = sinhx\ coshy + coshx\ sinhy$

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. a) State and prove the Mean Value Theorem for Definite Integrals.
    b) State and prove the Evaluation Theorem.

20. a) Define the volume of a solid using cross-sectional area.
    b) A pyramid 3 m high has a square base that is 3 m on a side. The crosssection of the pyramid perpendicular to the altitude x m down from the vertex is a square x m on a side. Find the volume of the pyramid.
    c) A curved wedge is cut from a circular cylinder of radius 3 by two planes. One plane is perpendicular to the axis of the cylinder. The second plane crosses the first plane at a 45° angle at the center of the cylinder. Find the volume of the wedge.

21. Evaluate the following
    (i) $\int sin^4 2x\ cos2x\ dx$.
    (ii) $\int sin^3 x\ dx$
    (iii) $\int cos2x\ dx$

22. Prove that
    (i) $cosh2x = \frac{1+tanh^2 x}{1-tanh^2 x}$
    (ii) $sinh2x = \frac{2tanhx}{1-tanh^2 x}$
    (iii) $cosh(x - y) = coshx\ coshy - sinhx\ sinhy$

(2×5=10 weightage)