QP CODE: 23507030

23507030

Reg No : .....

Name : .....

INTEGRATED MSC DEGREE EXAMINATION, AUGUST 2023

Second Semester

NTEGRATED MSC BASIC SCIENCE-PHYSICS

COMPLEMENTARY - IPH2CM05 - MATHEMATICS - II INTEGRAL CALCULUS AND FOURIER SERIES

2021 Admission Onwards

C45B0EAB

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Compute $\int_a^b x\,dx$.
2. What is the mean value of a function?
3. State the fundamental theorem of calculus part 1
4. Define the volume of a solid using cross section area.
5. Explain shell formula for revolution about a vertical line.
6. State the first form of Fubini's theorem,
7. Express the region as an iterated double inegral: the lines $y = x, y = \frac{x}{3}, y = 2$.
8. Define a perodic function. Give an example of a function which is not periodic.
9. Define Odd function. Check whether the function $f(x) = |x^3|$ even or odd?
10. Find the Taylor polynomial of order 2 generated by $f(x) = e^{2x}$ at $a = 0$.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. Find $\int x^3(x^4 - 1)^2\,dx$.
12. Find $\int \cos^2 x\,dx$.

13. Find the volume of the solid generated by revolving the region in the first quadrant bounded on the right by the circle $x^2 + y^2 = 3$, on the left by the line $x = \sqrt{3}$ and below by the line $y = \sqrt{3}$ about the y-axis.

14. Find the length of the curve $y = \int_{-2}^{x} \sqrt{3t^4 - 1}\, dt, \ -2 \le x \le -1.$

15. Integrate $f(x, y) = \frac{x}{y}$ over the region in the first quadrant bounded by the lines $y = x, y = 2x, x = 1, x = 2.$

16. Evaluate $\int_0^a \int_0^x \int_0^y xyz\, dz\, dy\, dx.$

17. Find the Fourier series expansion of

$$f(x) = \begin{cases} x & \text{if } -\pi < x < \pi/2 \\ 0 & \text{if } \pi/2 < x < \pi \end{cases}$$ in the interval $-\pi$ to π & $f(x + 2\pi) = f(x)$.

18. Find the fourier cosine series expansion of the function $f(x) = x, \ 0 < x < L.$

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. Find the area of the region bounded by
    (a) $x = y^2$ & $x = y + 2.$
    (b) $y^2 - 4x = 4$ & $4x - y = 16.$

20. Find the length of
    (a) $y = \frac{x^3}{3} + x^2 + x + 4 + \frac{1}{4x+4}, \ 0 \le x \le 2.$
    (b) $y = \frac{5}{12}x^{6/5} - \frac{5}{8}x^{4/5}, \ 1 \le x \le 32.$

21. (a)Write the formula for finding volume of a solid bounded above and below by the curves $y = g_2(x)$ and \ $y = g_1(x)$ and on the sides by $x = a, x = b$ in the plane $z = f(x, y)$.
    (b) Find the volume of the solid that lies beneath the surface $z = 16 - x^2 - y^2$ and above by the region R bounded by the curve $y = 2\sqrt{x}, y = 4x - 2$ and the x-axis.

22. (a) Find the Fourier series expansion of the function $f(x) = 2x, \ -1 \le x \le 1$ with period $p = 2L = 2.$
    (b) Find the Fourier series expansion of the function $f(x) = 3x^2, \ -1 \le x \le 1$ with period $p = 2L = 2.$

(2×5=10 weightage)