



QP CODE: 26802007



26802007

Reg No :

Name :

INTEGRATED M Sc DEGREE EXAMINATION APRIL 2026

Second Semester

INTEGRATED M Sc BASIC SCIENCES - CHEMISTRY

COMPLEMENTARY - ICH2CM05 - MATHEMATICS II - INTEGRAL CALCULUS AND DIFFERENTIAL EQUATIONS

2020 Admission Onwards

ABB6143F

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)

Answer any **eight** questions.

Weight 1 each.

1. The solid lies between the planes perpendicular to the x- axis at $x = 0$ and $x = 4$. The cross - sections perpendicular to the axis are circular disk with diameters run from the parabola $y = -\sqrt{x}$ to the parabola $y = \sqrt{x}$. Find the formula for the area $A(x)$ of the cross - sections.
2. Write the equation to find the volume of a solid generated by revolving about the y-axis.
3. Write the equation to find the arc length of the curve $x = g(y)$ from $y=c$ to $y=d$.
4. Evaluate $\int_0^3 \int_0^2 (4 - y^2) dy dx$
5. Sketch the region bounded by the lines $y = x$, $y = \frac{x}{3}$ and $y = 2$. Then express the area of the region as an iterated double integral.
6. Find the integrating factor of $(x^2 - 2x + 2y^2)dx + 2xy dy = 0$.
7. Solve $\frac{dy}{dx} - y = e^x y^2$.
8. When can we say that an edge of a graph G is incident with a vertex? Also define adjacent edges.
9. Define underlying simple graph of a graph. Give an example.
10. Define incidence matrix of a graph. Give an example.

(8×1=8 weightage)





Part B (Short Essay/Problems)

Answer any **six** questions.

Weight **2** each.

11. Find the Volume of the solid generated by revolving the region bounded by $y = x$, $y = 1$, $x = 0$ about the x- axis.
12. Find the area of the surface generated by revolving the curve $y = \sqrt{x}$, $\frac{3}{4} \leq x \leq \frac{15}{4}$ about x-axis.
13. Evaluate $\iint_R y \, dy \, dx$ where R is the region bounded by the parabola $y^2 = 4x$ and $x^2 = 4y$.
14. Define average value of a function over a region R in a plane. Also find the average value of $f(x, y) = xy$ over the square bounded by the lines $x = 1$, $y = 1$ in the first quadrant.
15. Solve $(x^2 - 4xy - 2y^2)dx + (y^2 - 4xy - 2x^2)dy = 0$.
16. Solve the initial value problems $xy' + y = e^x$; $y(1) = 2$.
17. Give two examples in which graphs provide natural mathematical model.
18. Define graph isomorphism. Give an example.

(6×2=12 weightage)

Part C (Essay Type Questions)

Answer any **two** questions.

Weight **5** each.

19. a) Use shell method to find the volume of the solid generated by revolving the regions bounded by $y = x^2$, $y = 2 - x^2$, $x = 0$ for $x \geq 0$ about y-axis.
b) Use shell method to find the volume of the solid generated by revolving the regions bounded by $y = \sqrt{x}$, $y = 0$, $y = 2 - x$ about x-axis.
20. a) Evaluate $\int_0^1 \int_0^{1-x} \int_0^{x+y} e^z \, dz \, dy \, dx$.
b) Evaluate $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} xy \, dz \, dy \, dx$.
c) Evaluate $\int_0^1 \int_0^\pi \int_0^\pi y \sin z \, dx \, dy \, dz$.
21. a) Solve $y' + \operatorname{cosec} y = 0$.
b) Solve $\frac{dy}{dx} + 5xy = 0$.
c) Solve $y' = 2x^{-1} \sqrt{1-y}$.
22. a) Solve $2xy \frac{dy}{dx} - y^2 + x^2 = 0$.
b) Solve $ydx - 2(x+y)dy = 0$.

(2×5=10 weightage)

