K17U 0637

Reg. No. : .....

Name : .....

IV Semester B.Sc. Degree (CBCSS – Reg./Supple./Imp.) Examination, May 2017
(2014 Admn. Onwards)
COMPLEMENTARY COURSE IN MATHEMATICS
4C04 MAT – CH : Mathematics for Chemistry – IV

Time : 3 Hours Max. Marks : 40

SECTION – A

All the first **4** questions are **compulsory**. They carry **1** mark **each.**

1. Give the parametric representation of the straight line through (5, 1, 2) and (11, 3, 0).
2. Evaluate $\int_{(5,0)}^{(0,5)} \left(y^2e^{2x}dx + ye^{2x}dy\right)$.
3. Give the Newton's forward difference interpolation formula.
4. What do you mean by interpolation ? **(4×1=4)**

SECTION – B

Answer **any 7** questions from among the questions **5** to **13.** These questions carry **2** marks **each**.

5. Find the tangent to the curve C : r(t) = [t, t^2, 0] at the point P : (2, 4, 0).
6. Is there a vector field v on R^3 such that curl v = [x sin y, cos y, z – xy] ? Justify.
7. Find the directional derivative of $f(x, y, z) = (x^2 + y^2 + z^2)^{-1/2}$ at P : (4, 2, –4) in the direction of a = [1, 2, –2].

P.T.O.

8. Find a parametric representation and a normal vector to the elliptic paraboloid, $z = 4x^2 + y^2$.

9. Use Green's theorem to evaluate $\int_C F(r) \cdot dr$ counter clockwise around the boundary curve C of the region R, where F = [y sin x, 2x cos y], R the square with vertices (0, 0), (π/2, 0), (π/2, π/2), (0, π/2).

10. Calculate $\int_C F(r) \cdot dr$ where F = [cosh x, sinh y, e^z], C : r = [t, t^2, t^3] from (0, 0, 0) to (1/2, 1/4, 1/8).

11. Use Newton-Raphson method to find a root of the equation $x^3 - 2x - 5 = 0$.

12. Given $\frac{dy}{dx} = 1 + xy$, y(0) = 1, find y(0.1) correct to four decimal places, by Taylor series.

13. Explain Euler's method for the solution of a differential equation. **(7×2=14)**

SECTION – C

Answer **any 4** questions from among the questions **14** to **19**. These questions carry **3** marks **each**.

14. Find the velocity, speed and acceleration of the motion given by r(t) = [5 cos t, sint, 2t] at the point P : [$5/\sqrt{2}$, $1/\sqrt{2}$, π/2].

15. Calculate the line integral $\oint_C F \cdot r' ds$, by Stokes's theorem where F = [4z, – 2x, 2x], C the intersection of $x^2 + y^2 = 1$ and z = y + 1.

16. Certain corresponding values of x and $\log_{10}x$ are (300, 2.4771), (304, 2.4829), (305, 2.4843) and (307, 2.4871). Find $\log_{10} 301$, using Lagrange's formula.

17. Use the method of false position to find a real root, correct to three decimal places of the equation, $x^3 + x^2 + x + 7 = 0$.

18. The table below gives the values of tan x for $0.10 \leq x \leq 0.30$. Find tan 0.12.

x	0.10	0.15	0.20	0.25	0.30
tan x	0.1003	0.1511	0.2027	0.2553	0.3093

19. Given the differential equation $\frac{dy}{dx} = \frac{x^2}{y^2 + 1}$ with the initial condition y = 0 when x = 0, use Picard's method to obtain y for x = 0.5. **(4×3=12)**

SECTION – D

Answer **any 2** questions from among the questions **20** to **23**. These questions carry **5** marks **each**.

20. Let f(x, y, z) = zy + yx, v = [y, z, 4z – x], w = [y^2, z^2, x^2]. Find :
    i) grad f at (3, 4, 0)
    ii) f grad f at (3, 4, 0) and
    iii) div (v × w).

21. Evaluate $\iint_S F \cdot n dA$, where F = [y^3, x^3, $3z^2$], S the portion of the paraboloid $z = x^2 + y^2$, $z \leq 4$.

22. State the trapezoidal rule for finding an approximate area under a given curve. A curve is given by the points (x, y) given below. Estimate the area bounded by the curve, the x-axis and the extreme ordinates.

x	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	23	19	14	11	12.5	16	19	20	20

23. Use Runge-Kutta fourth order formula to find y(0.2) and y(0.4) given that $y' = \frac{y^2 - x^2}{y^2 + x^2}$, y(0) = 1. **(2×5=10)**