Reg. No. : ....

Name : ....

K19U 0583

IV Semester B.Sc. Degree (CBCSS-Reg./Supp./Imp.) Examination, April 2019
(2014 Admission Onwards)
COMPLEMENTARY COURSE IN MATHEMATICS
4C04 MAT-CS : Mathematics for Computer Science – IV

Time : 3 Hours Max. Marks : 40

SECTION – A

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

1. Find the gradient of the function $f = x^2 + y^2$.

2. The line integral of a vector function $F = [F_1, F_2, F_3]$ is path independent if and only if ____________

3. Give the Newton Raphson iteration formula to find an approximate root of $f(x) = 0$.

4. Give Euler's iteration formula to solve the differential equation $y' = f(x, y) \quad y(x_0) = y_0$.

SECTION – B

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

5. Given a curve $C = r(t)$ where $r(t) = [3\cos t, 3\sin t, 4t]$ find a tangent of C at$(3, 0, 8\pi)$.

6. Find Curl V for $V = yzi + 3xzj + zk$.

7. Evaluate the line integral $\int_C F(r).dr$ $F = x^2i + y^2j$ C is the semicircle from (2, 0) to (–2, 0).

8. Evaluate using Green's theorem evaluate $\int_C F(r).dr$ for the function $F = e^x \cos yi - e^x \sin yj$ where R is the semi disk $x^2 + y^2 \le a^2$ $x \ge 0$.

P.T.O.

9. Evaluate the flux integral $\iint_S F.ndA$ for the following data $F = [x^2, y^2, z^2]$

$S : x + y + z = 4 x \geq 0 \quad y \geq 0 \quad z \geq 0.$

10. Evaluate using Divergence theorem $\iint_S F.ndA$, $F = [4x, 3z, 5y]$ and S is the surface of the cone $x^2 + y^2 \leq z^2 \quad 0 \leq z \leq 2.$

11. Explain bisection method for finding a real root of an equation.

12. Using Taylor series for y(x), find y(0.1) correct to four decimal places.

13. Solve by Picard's method $y' = x + y^2$ subject to the condition y = 1 when x = 0.

SECTION – C

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

14. Let $v = [y, z, 4z - x]$ $w = [y^2, z^2, x^2]$ find div $(v \times w)$.

15. Evaluate the flux integral $\iint_S F.ndA$ for the following data $F = [\cosh yz, 0, y^4]$

$S : y^2 + z^2 = 1, 0 \leq x \leq 20 \quad z \geq 0.$

16. Evaluate using divergence theorem $\iint_S F.ndA$, $F = [x^3 - y^3, y^3 - z^3, z^3 - x^3]$ and

S is the surface of the sphere $x^2 + y^2 + z^2 \leq 25 \quad z \geq 0.$

17. Find a real root of the equation sin x = 1 – x using Newton Rapson method.

18. Using modified Euler's method find y(0.2) given that $y' = e^x + y \quad y(0) = 0.$

19. Explain the terms numerical integration and numerical differentiation.

SECTION – D

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

20. Show that the integral $\int_{(2,0,1)}^{(4,4,0)} \left[2x\left(y^3 - x^3\right) dx + 3x^2y^2dy - 3x^2z^2dz\right]$ is path independent and find the value of the integral.

21. Verify divergence theorem for $F = 7xi - xk$ over the sphere $x^2 + y^2 + z^2 = 4$.

22. From the following table of values of x and y obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.2$.

x	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

23. Given $\frac{dy}{dx} = y - x$ where $y = 2$ when $x = 0$. Find $y(0.1)$ and $y(0.2)$ using fourth order Runge Kutta Method.
