K17U 0639

Reg. No. : ....

Name : ....

IV Semester B.Sc. Degree (CBCSS-Reg./Supple./Imp.) Examination, May 2017
(2014 Admn. Onwards)
COMPLEMENTARY COURSE IN MATHEMATICS
4C04MAT-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 value of ∇f at (4, 3) where $f = \ln(x^2 + y^2)$.
2. State the Divergence Theorem of Gauss.
3. What is meant by the forward differences of a function ?
4. What is meant by numerical integration ? **(4×1=4)**

SECTION – B

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

5. Let $v = [x, y, v_3]$. Find a v_3 such that (a) div $v > 0$ everywhere (b) div $v > 0$ if $|z| < 1$ and div $v < 0$ if $|z| > 1$.
6. Find the directional derivative of $f(x, y, z) = 4x^2 + y^2 + 9z^2$ at P : (2, 4, 0) in the direction of $a = [-2, -4, 3]$.
7. Find div $(v \times w)$ where $v = [y, z, 4z - x]$ and $w = [y^2, z^2, x^2]$.

P.T.O.

8. Use Green's theorem to evaluate $\int_C F(r).dr$ counterclockwise 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).

9. Show that the integral $\int_C (2x\,dx + 2y\,dy + 4z\,dz)$ is path independent in any domain in space and find its value in the integration from (0, 0, 0) to (2, 2, 2).

10. Obtain Green's theorem in the plane as a special case of Stoke's theorem.

11. Find a real root of the equation $x^3 - x - 1 = 0$ by the bisection method.

12. Given $\frac{dy}{dx} = x + y$; y(0) = 0, compute y(0.2) using Euler's modified method.

13. Using Picard's method, find y(0.1), given that $\frac{dy}{dx} = \frac{y-x}{y+x}$ and y(0) = 1. **(7×2=14)**

SECTION – C

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

14. Determine the constants a and b such that $v = [2xy + 3yz, x^2 + axz - 4z^2, 3xy + 2byz]$ is irrotational.

15. Evaluate $\iint_S F.n\,dA$, where $F = [x^2, 0, 3y^2]$ and S is the portion of the plane $x + y + z = 1$ in the first octant.

16. Values of x(in degrees) and sin x are given in the following table :

x	15	20	25	30	35	40
sin x	0.2588190	0.3420201	0.4226183	0.5	0.5735764	0.6427876

Determine sin 38°, using Newton's backward difference formula.

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

18. Using Lagrange's interpolation formula, find the form of the function y(x) from the following table :

x	0	1	3	4
y	–12	0	12	24

19. Given $y' = 1 + xy$; $y(0) = 1$, use Taylor's series method to determine y(0.1), correct to four decimal places. **(4×3=12)**

SECTION – D

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

20. a) Find the length of the circular helix r(t) = [2 cos t, 2 sin t, 6t] from (2, 0, 0) to (2, 0, 24π).

b) Show that a circle of radius a has curvature 1/a.

21. Verify Stoke's theorem for $F = \left[z^2, \frac{3}{2}x, 0\right]$, S the square $0 \le x \le a$, $0 \le y \le a$, $z = 1$.

22. From the following table of values of x and y, obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for x = 2.2

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, $\frac{dy}{dx} = 1 + y^2$; $y(0) = 0$, use Runge-Kutta method with h = 0.2, to find y(0.2), y(0.4) and y(0.6). **(2×5=10)**