



K24U 0930

Reg. No. :

Name :

**IV Semester B.Sc. Degree (C.B.C.S.S. - Supplementary/One Time Mercy
Chance) Examination, April 2024
(2014 to 2018 Admissions)**

**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 : (4×1=4)

1. Give an example of a scalar field.
2. Define curvature of a curve C.
3. Define a line integral over a vector function.
4. Define forward difference operator.

SECTION – B

**Answer any 7 questions from among the questions 5 to 13. These questions carry
2 marks each : (7×2=14)**

5. Find a unit normal vector n of the cone of revolution $z^2 = 4(x^2 + y^2)$ at the point $P : (1, 0, 2)$.
6. Find curl v with respect to right-handed Cartesian coordinates where $v = [y^n, z^n, x^n]$, ($n > 0$, integer).
7. Calculate $\int_C F(r)dr$, where $F = [x^2, y^2, 0]$, and C is the semicircle from $(2, 0)$ to $(-2, 0)$, $y \geq 0$.
8. Evaluate $\int_{(5,0)}^{(0,5)} (y^2 e^{2x} dx + ye^{2y} dy)$.
9. Write Newton's forward difference interpolation formula.
10. Certain corresponding values of x and $\log_{10} x$ are $(300, 2.4771)$, $(304, 2.4829)$, $(305, 2.4843)$ and $(307, 2.4871)$. Find $\log_{10} 301$?

P.T.O.



11. Explain errors in numerical differentiation.
12. Explain the Trapezoidal rule.
13. Evaluate $\int_0^{2\pi} \frac{1}{x} dx$ using Simpson's rule.

SECTION – C

Answer **any 4** questions from among the questions **14** to **19**. These questions carry **3** marks **each** : **(4×3=12)**

14. Find a normal vector of the surface $x^2 + 3y^2 + z^2 = 28$ at the given point $P : (4, 1, 3)$.
15. Find the directional derivative of $f = x^2 + y^2 + z^2$ at $P = (2, -2, 1)$ in the direction of $a = [-1, -1, 0]$.
16. Find the length of circular helix $r(t) = [2\cos t, 2\sin t, 6t]$ from $(2, 0, 0)$ to $(2, 0, 24\pi)$.
17. Use the Newton – Raphson method, find a real root of the equation $x \sin x + \cos x = 0$.
18. From the Taylor series for $y(x)$, find $y(0.1)$ correct to four decimal places if $y(x)$ satisfies $Y' = x - y^2$ and $y(0) = 1$.
19. Determine the value of y when $x = 0.1$, given that $y(0) = 1$ and $Y' = x^2 + y$.

SECTION – D

Answer **any 2** questions from among the questions **20** to **23**. These questions carry **5** marks **each** : **(2×5=10)**

20. Verify Stokes' theorem for $F = [0, 0, 5x \cos z]$ and $S : x^2 + y^2 = 4, y \geq 0, 0 \leq z \leq \frac{1}{2} \pi$.
 21. Verify Green's theorem for $F = [y^2 - 7y, 2xy + 2x]$ and C is the circle $x^2 + y^2 = 1$.
 22. Using Runge-Kutta method of both second order and fourth order formula, find $y(0.1)$ and $y(0.2)$ correct to four decimal places, given $\frac{dy}{dx} = y - x$ where $y(0) = 2, h = 0.1$.
 23. Using Bisection method, find a real root of the equation $x^3 - 2x - 5 = 0$.
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