



K19U 0580

Reg. No. :

Name :

IV Semester B.Sc. Degree (CBCSS – Reg./Supp./Imp.)
Examination, April 2019
(2014 Admission Onwards)
COMPLEMENTARY COURSE IN MATHEMATICS
4C04 MAT – PH : Mathematics for Physics and Electronics – IV

Time : 3 Hours

Max. Marks : 40

SECTION – A

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

1. Find curl, $\vec{r}, \vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$
2. State Green's theorem.
3. Give the iteration formula for Euler method.
4. What is an algebraic equation ?

SECTION – B

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

5. Find the arc length of that portion of the circular helix $x = \cos t, y = \sin t, z = t$ from $t = 0$ to $t = \pi$.
6. Find the curvature of a circle of radius a .
7. Find the directional derivative of $f(x, y) = xy$ at $(1, 2)$ in the direction of

$$\vec{a} = \frac{\sqrt{3}}{2}\vec{i} + \frac{1}{2}\vec{j}$$

P.T.O.

8. Evaluate $\int_C F \cdot dr$ where $F = -y \bar{i} - xy \bar{j}$ and c is the circular arc given by $r(t) = \cos t \bar{i} + \sin t \bar{j}$, $0 \leq t \leq \frac{\pi}{2}$.
9. $F(x, y) = y \bar{i} + x \bar{j}$, evaluate $\int_{(0,0)}^{(1,1)} F \cdot dr$.
10. Find the area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ using Green's theorem.
11. Show that $\nabla = \Delta E^{-1}$.
12. Explain Euler method to solve first order ordinary differential equation.
13. Using Taylor series, solve $y' = x - y^2$, $y(0) = 1$.

SECTION - C

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

14. If $F = f(x, y, z)$ is a differentiable vector field, show that $\text{div} (\text{curl } F) = 0$.
15. Find the workdone by the force field $F(x, y) = (e^x - y^3) \bar{i} + (\cos y + x^3) \bar{j}$ on a particle that travels once around the unit circle $x^2 + y^2 = 1$ in the counter clockwise direction.
16. Find real root of the equation $x^3 - 2x - 5 = 0$ using Bisection method.
17. Use Picard's method to obtain y for $x = 0.25$, $\frac{dy}{dx} = \frac{x^2}{y^2 + 1}$, $y(0) = 0$.
18. Derive Newton's forward interpolation formula.
19. Find $\frac{dy}{dx}$ for the function at $x = 3$.
- | | | | | | | |
|-------|-----|---------|--------|-------|-------|----|
| $x :$ | 3 | 3.2 | 3.4 | 3.6 | 3.8 | 4 |
| $y :$ | -14 | -10.032 | -5.296 | 0.256 | 6.672 | 14 |



SECTION – D

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

20. Find the curvature of the ellipse $\vec{r} = 2\cos t \vec{i} + 3 \sin t \vec{j}$ at the end points of its major axis.
21. Verify Gauss divergence theorem for $f(x, y, z) = 2x \vec{i} + 3y \vec{j} + z^2 \vec{k}$ across the unit cube.
22. Evaluate $\int_1^3 \frac{1}{x} dx$ by simpsons rule with 8 strips.
23. Use Runge-Kutta method to solve $10 \frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$ for the interval $0 < x \leq 0.4$ with $h = 0.1$.
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