K20U 0883

Reg. No. : .....

Name : .....

IV Semester B.Sc. Degree (CBCSS-Reg./Sup./Imp.) Examination, April 2020
(2014 Admn. Onwards)
COMPLEMENTARY COURSE IN MATHEMATICS
4C04MAT-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. Write the parametric representation of the circle $x^2 + y^2 = 4$.
2. Evaluate $\int_C x^2dy + y^2dx$ where C is the path y = x from (0, 0) to (1, 1).
3. Give the Newton – Raphson Formula to find a root of the equation.
4. Write the general formula to find the numerical solutions of ordinary differential equations using Euler's method. **(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 gradient of $f(x, y, z) = ye^{xz} + z^3$ at (0, 2, 3).
6. Find div curl $\vec{F}$, where $\vec{F} = xz^3\hat{i} - 2x^2yz\hat{j} + 2yz^4\hat{k}$.
7. Find the arc length of the curve $\vec{r}(t) = a\cos t\hat{i} + a\sin t\hat{j}$ from t = 0 to $t = \pi$.
8. Evaluate by Stoke's theorem $\int_C yzdx + zxdy + xydz$, where c is the curve $x^2 + y^2 = 1$.
9. Evaluate $\int_C (x - 2y)dx + (3x - y)dy$ where c is a unit square.

P.T.O.

10. If S is a closed surface enclosing a volume 3 cubic unit and if $\vec{F} = x\hat{i} + 2y\hat{j} + 3z\hat{k}$, then evaluate $\iint_S \vec{F}.\hat{n}\, ds$.

11. Find a real root of the equation $f(x) = x^3 - x - 1 = 0$ that lies between 1 and 1.5 using bisection method correct to 2 decimal places.

12. Find a Lagranges polynomial for the following data : $y(1) = 1$ $y(3) = 27$, $y(4) = 64$.

13. Use trapezoidal rule to evaluate $\int_0^2 e^{x^2}\, dx$ by taking the number of intervals as 10. **(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 potential function for $\vec{F} = (6xy + z^3)\hat{i} + (3x^2 - z)\hat{j} + (3xz^2 - y)\hat{k}$.

15. Show that $\int_{(0,0)}^{(3,2)} 3x^2e^y dx + x^3e^y\, dy$ is independent of the path. Hence evaluate the integral.

16. Using Regula Falsi method find a root of the equation $2x = \log_{10}x + 7$ that lies between 3 and 4, correct to 3 decimal places.

17. Compute $\int_0^1 \frac{1}{1+x^2}\, dx$ using Simpson's $\frac{1}{3}^{rd}$ rule with step size $h = 0.25$.

18. Solve the equation $y^1 = x + y^2$, subject to the condition $y = 1$, when $x = 0$ using Picard's method.

19. Use Euler method with $h = 0.025$ to compute the value of $y(0.1)$ for $y^1 = x - y^2$, $y(0) = 1$. **(4×3=12)**

SECTION – D

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

20. Find a unit vector in the direction along which the function $f(x, y) = 4x^3y$ is increasing rapidly at $(-1, 1)$.

21. Evaluate the surface integral $\iint_S \vec{F}.\hat{n}\, ds$ where $\vec{F} = [x^2, 0, 3y^2]$ and S is the portion of the plane $x + y + z = 1$ in the first octant.

22. Use Newtons interpolation formula to estimate the value of $\sin 8°$ from the following data :

θ	5	10	15	20	25	30
$\sin\theta$	0.0871	0.1736	0.2588	0.3420	0.4226	0.5

23. Use Runge-Kutta method of order four to find y(0.1) and y(0.2) correct to four decimal places, given $\frac{dy}{dx} = y - x$ where $y(0) = 2$. **(2×5=10)**