K16U 0625

Reg. No. : ....

Name : ....

IV Semester B.Sc. Degree (CBCSS – 2014 Admn. – Regular) Examination, May 2016
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 value of ∇f at $(1, \pi)$ where $f = e^x \sin y$.

2. Evaluate $\int_C (dx + dy)$ where C is a smooth curve from point (1, 2) to (3, 4).

3. Give the Newton-Raphson iteration formula.

4. Give the Newton's backward difference interpolation formula. **(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 directional derivative of $f(x, y, z) = e^x \sin y$ at P : $(2, \pi/2, 0)$ in the direction of a = [2, 3, 0].

6. Find a normal vector of the surface $x^2 - y^2 + 4z^2 = 67$ at P : (–2, 1, 4).

7. Is there a vector field v on R^3 such that curl v = [x sin y, cos y, z – xy] ? Justify.

8. Calculate $\int_C F(r).dr$ where F = [z, x, y], C : r = [cos t, sin t, t] from (1, 0, 0) to $(1, 0, 4\pi)$.

P.T.O.

9. Let C be the positively-oriented boundary of the region enclosed by the parabolas $y = x^2$ and $x = y^2$. Use Green's Theorem to evaluate $\int_C \left(y + e^{\sqrt{x}}\right)dx + (2x + \cos y^2)dy$.

10. Evaluate $\iint_S (7xi - zk).n\ dA$ over the sphere $S : x^2 + y^2 + z^2 = 4$.

11. If $y_1 = 4$, $y_3 = 12$, $y_4 = 19$ and $y_x = 7$, find x, using Lagrange's formula.

12. Given $\frac{dy}{dx} = x^2 + y$; $y(0) = 1$, compute y(0.1) using Euler's modified method.

13. Solve the equation $y' = x + y^2$, subject to the condition y = 1 when x = 0, by Picard's method. **(7×2=14)**

SECTION – C

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

14. Given the curve $C : r(t) = [3 \cos t, 3 \sin t, 4t]$, find a tangent vector $r'(t)$, a unit tangent vector $u'(t)$ and the tangent of C at $P : (3, 0, 8\pi)$.

15. Evaluate $\iint_S F.n\ dA$ by the divergence theorem where $F = [4x, 3z, 5y]$, S the surface of the cone $x^2 + y^2 \leq z^2$, $0 \leq z \leq 2$.

16. Evaluate $I = \int_0^1 \frac{1}{1+x} dx$ correct to three decimal places using both the trapezoidal and Simpson's rules with h = 0.125.

17. Find a root of the equation $4e^{-x} \sin x - 1 = 0$ by regula-falsi method, given that the root lies between 0 and 0.5.

18. Find the cubic polynomial which takes the following values : y(1) = 24, y(3) = 120, y(5) = 336 and y(7) = 720. Hence, obtain the value of y(8).

19. Given $y' = x - y^2$; $y(0) = 1$, 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. Show that if C is represented by r(t) with arbitrary t, then the curvature is given by $K(t) = \dfrac{\sqrt{(r'.r')(r''.r'') - (r'.r'')^2}}{(r'.r')^{3/2}}$.

21. Verify Stokes's theorem for $F = [y^3, -x^3, 0]$, $S : x^2 + y^2 \leq 1, z = 0$.

22. From the following table of values of x and y, obtain $\dfrac{dy}{dx}$ and $\dfrac{d^2y}{dx^2}$ for x = 1.6.

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. Use Runge-Kutta fourth order formula to find y(0.2) and y(0.4) given that $y' = \dfrac{y^2 - x^2}{y^2 + x^2}$, y(0) = 1. **(2×5=10)**