(8. Use the method of tales printern to find a malured, correct to think decimal places of the equation $x^2 - x - 4 = 0$ (9. Owen y = 1 + xyyy(0) = 1, use Taylor's some method to determine y(0, 1), correct to hair decimal manes.

(9. SECTION - D

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IV Semester B.Sc. Degree (CBCSS - Reg./Supple./Imp.) Examination,
May 2017

(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. Find ∇f where f(x, y) = (x 2)(y + 2).
- 2. Evaluate $\int_{C} (2xydx + x^2dy)$ where C is a smooth curve from point (1, 2) to (3, 4).
- 3. For the differential equation $y' = \frac{x^2}{y^2 + 1}$, find the first approximation to y given by Picard's method subject to the condition y = 0 when x = 0.
- 4. Give example of an initial value problem.

 $(4 \times 1 = 4)$

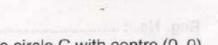
SECTION - B

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

- 5. Find a unit normal vector of the cone of revolution $z^2 = 4(x^2 + y^2)$ at the point P: (1, 0, 2).
- 6. Prove or disprove : If div v = 0 then curl v = 0.
- 7. 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].







- 8. Calculate $\int_{C} F(r) dr$ where $F = [e^{x}, e^{y}]$, clockwise along the circle C with centre (0, 0) from (1, 0) to (0, -1).
- 9. Use Green's theorem to evaluate $\int_{0}^{\infty} F(r) dr$ counterclockwise around the boundary curve C of the region R, where $F = [-e^{y}, e^{x}]$, R the triangle with vertices (0, 0), (2, 0), (2, 1).
- _10. Evaluate $\iint\limits_{S}F.ndA$ where $F=[x^2,\,y^2,\,z^2],\,S:x+y+z=4,\,x\,\geq\,0,\,y\,\geq\,0,\,z\,\geq\,0.$
- 11. Find an approximate value of a real root of the equation $x^3 2x 5 = 0$ by the bisection method.
- 12. Find a cubic polynomial which takes the following values :

$$y(0) = 1$$
, $y(1) = 0$, $y(2) = 1$, $y(3) = 10$.

13. Given
$$\frac{dy}{dx} = x + y$$
; $y(0) = 0$, compute $y(0.2)$ using Euler's modified method. (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 total length of the hypocycloid $r(t) = [a cos^3 t, a sin^3 t]$.
- 15. Evaluate \iint_S F.ndA by the divergence theorem where F = [3xy², yx² y³, 3zx²], S the surface of x² + y² \leq 25, 0 \leq z \leq 2.
- 16. Finding divided differences from the following table, obtain f(x) as a polynomial in x.

X	-1	0	3	6	7
f(x)	3	-6	39	822	1611



- 17. Explain the trapezoidal rule for numerical integration.
- 18. Use the method of false position to find a real root, correct to three decimal places, of the equation $x^3 x 4 = 0$.
- 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 curl and divergence of the vector field $v = [x^2yz, xy^2z, xyz^2]$.
 - b) Show that the torsion of a plane curve is identically zero.
- 21. Verify Stoke's theorem for $F = [y^3, -x^3, 0]$, $S: x^2 + y^2 \le 1$, z = 0.
- 22. The equation $2x = log_{10} x + 7$ has a root between 3 and 4. Find this root, correct to three decimal places, by regula-falsi method.
- 23. Use Runge-Kutta fourth-order formula to find y(0.1) and y(0.2), given that

$$\frac{dy}{dx} = y - x$$
; $y(0) = 2$. (2×5=10)