TB173520C

Reg. No: ……………………

Name: ……………………

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION, OCTOBER 2018
(2017 Admissions Regular, 2016 Admissions Supplementary/Improvement & 2015 Admissions Supplementary)
SEMESTER III – COMPLEMENTARY COURSE (MATHEMATICS)
MT3CPC03B - VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND ANALYTICAL GEOMETRY
(For Physics and Chemistry)

Time: Three Hours **Maximum Marks: 80**

PART A

I Answer all questions. Each question carries 1 mark

1. Write the vector function representing Helix.
2. Show that F =(2x - 3) i - 2 j+ (cos z) k is not conservative.
3. Find the general integrating factor of $x\frac{dy}{dx} + 3y = x^3$
4. Write the Bernoulli's equation.
5. Find the polar equation of $x - y = 3$
6. What is the eccentricity of the hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$

(6x1=6)

PART B

II Answer any seven questions. Each question carries 2 marks

7. Find **N** for the curve **r**(t) = (cost + t sin t) **i** + (sint - t cos t) **j**t> 0 .
8. Find the derivative of $f(x, y) = xe^y + \cos(xy)$ at the point (2, 0) in the direction of **a** = 3i-4j.
9. Evaluate $\int_C (x - y + z - 2)\, ds$ where C is the straight line segment from x = t , y = 1- t , z = 1 , from (0,1,0) to (1,0,0) .
10. Find the work done by **F** over the curve in the direction of increasing t where **F** = 2y **i**+ 3x **j** +(x+y)**k**,**r**(t) = (cos t) **i** + (sin t)**j** $-(\frac{t}{6})$**k**, $0 \le t \le 2\pi$.
11. Find the outward flux of the field **F**(x,y) = x**i**+ y^2**j** across the square bounded by the lines x = ±1 and y = ±1 .
12. Solve$(x + \sin y)dx + (y^2 + x\cos y)dy = 0$
13. Solve $y - px = \frac{p}{1+p}$
14. Find the centre, vertices of the hyperbola $x^2 - y^2 - 2x + 4y = 4$
15. The parabola $x^2 = -4y$ is shifted left 1 unit and 3 unit to generate the parabola $(x + 1)^2 = -4(y - 3)$. Find the vertex, foci and directrix of new parabola.
16. Write the parametric representation of the hyperbola $x^2 - y^2 = 1$

(7x2=14)

PART C

IV Answer any five questions. Each question carries 6 marks

17. The velocity of a particle moving in space is given by $\frac{dr}{dt}$= cos t **i** - sin t **j**+ **k**. Find the particles position as a function of t if **r**= 2 **i** + **k**when t = 0.
18. Find the curvature for the curve $r(t) = e^t\cos t\,\mathbf{i} + e^t\sin t\,\mathbf{j} + 2\mathbf{k}$.
19. Find the area of the surface cut from the paraboloid $x^2+y^2- z = 0$ by the plane z = 2.
20. Use divergence theorem to find the outward flux **F** across the boundary of the region D, where **F** = (y - x)**i** + (z - y) **j**+ (y - x)**k** and D is the cube bounded by the planes x = ± 1, y = ± 1and z = ± 1.
21. Solve $x\frac{dy}{dx} - 2y = \frac{3y^4}{x}, y(1) = 1/2$
22. Solve$(x + y)dy + (x - y)dx = 0$
23. Solve $x(\frac{dy}{dx})^3 - 12\frac{dy}{dx} - 8 = 0$
24. Convert the following equation to polar equation
    a) $(x-2)^2 + y^2 = 4$
    b) $x^2 - y^2 = 1$

(5x6=30)

PART D

IV Answer any two questions. Each question carries 15 marks

25. Find T N and κ for the space curve r(t) = (3 sin t) i + (3 cos t) j + 4 t k
26. Use stoke's theorem to calculate the circulation of the field $F = 2y\, i + 3x\, j - z^2\, k$ around the curve C = $x^2+y^2 = 9$ in the xy plane counter clock wise.
27. Sketch the ellipse which include the directrix that corresponds to the focus at the origin
    (a) $r = \frac{25}{10-5\cos\theta}$ (b) $r = \frac{400}{16+8\sin\theta}$
28. Solve the differential equation
    a) $y^2 - 1 - p^2 = 0$
    b) $\frac{x}{y}(\ln x - \ln y - 1)dy = -dx, y(1) = e$

(2x15=30)