TB174205C **Reg.No……………....…**

Name.…………........……

B. Sc. DEGREE (C.B.C.S.S) EXAMINATION, MARCH 2019
(2017 Admissions Regular, 2016 Admissions Improvement/Supplementary & 2015 Admissions Supplementary)
SEMESTER IV- CORE COURSE (COMPUTER APPLICATIONS)
CAM4B04TB - VECTOR CALCULUS, THEORY OF EQUATIONS AND GRAPH THEORY

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

PART A

I. Answer all questions. Each question carries 1 mark

1. Find parametric equation for the line through (-2,0,4) parallel to **v** =2i + 4j -2k.
2. Find the gradient field of f(x,y,z) = xyz.
3. Define symmetric functions of the roots.
4. Define reciprocal equations.
5. Define simple Graph.
6. When a walk is said to be a path?

(6x1=6)

PART B

II Answer any seven questions. Each question carries 2 marks

7. Find parametric equations for the line through P(-3,2,-3) and Q(1,-1,4).
8. Find the point where the line x = $\frac{8}{3}+$ 2t , y = -2t , z = 1+t intersects the plane 3x + 2y +6z = 6.
9. Evaluate $\int(cost\ i + j - 2tk)$dt.
10. State fundamental theorem of line integrals.
11. Verify divergence theorem for the field **F** = xi + yj + zk over the sphere $x^2 + y^2 + z^2 = a^2$.
12. A coil spring lies along the helix r(t) = (cos 4t) i + (sin 4t) j + tk, $0 \leq t \leq 2\pi$. The spring's density is a constant ,$\delta = 1$. Find the spring's mass and moment of inertia about the z-axis.
13. If α, β, γ are the roots of $x^3 - x - 1 = 0$, then find the equation whose roots are $\frac{1+\alpha}{1-\alpha}, \frac{1+\beta}{1-\beta}, \frac{1+\gamma}{1-\gamma}$.
14. Solve $x^4 - 5x^3 + 4x^2 + 8x - 8 = 0$, given that one of the root is $1-\sqrt{5}$.
15. Define
    i)Path ii) Cut vertex iii) Bridge iv) trail
16. Let G be connected graph. Then prove that G is a tree if and only if every edge of G is a bridge.

(7x2=14)

PART C

III. Answer any five questions. Each question carries 6 marks

17. a) Find the derivative of f(x,y) = x^2 sin 2y at the point $(1, \frac{\pi}{2})$ in the direction of v = 3i – 4j.

 b) Find an equation for the tangent to the ellipse $\frac{x^2}{4} + y^2 = 2$.

18. a) Estimate how much the value of f(x,y,z) = y sin x + 2yz will change if the point P(x,y,z) moves 0.1 unit from $P_0(0,1,0)$ straight toward $P_1(2,2,-2)$.

 b) Also find plane tangent to the surface z = 1 - $\frac{1}{10}(x^2 + 4y^2)$ at $(1, 1, \frac{1}{2})$.

19. a) A fluid's velocity field F = xi + zj + yk. Find the flow along the helix r(t) = (cost) i + (sint)j +tk, $0 \leq t \leq \frac{\pi}{2}$.

 b) Also find the parametrization of the cylinder $x^2 + (y-3)^2 = 9, 0 \leq z \leq 5$.

20. a) State Green's theorem (normal form and tangential form)

 b) Using Green's theorem , calculate the outward flux of the field F(x,y) = $x^2 i + xyj$ across the square bounded by the lines x = 0,y = 0, x = a, and y = a (a> 0)

21. a)prove that every equation of the n th degree has exactly n roots.

 b) If α, β, γ are the roots of the function f(x) = $x^3 + P_1x^2 + P_2x + P_3 = 0$,find the equation whose roots are $\alpha^3, \beta^3, \gamma^3$.

22. Solve $x^3 - 27x + 54 = 0$, using Cardan's method.

23. A connected graph G with n vertices has atleast n-1 edges. Prove.

24. Prove : a graph G is connected if and only if it has a spanning tree.

(5x6=30)

PART D

IV. Answer any two questions. Each question carries 15 marks

25. a) Prove that the curvature of a circle of radius a is $\frac{1}{a}$.

 b) Find and graph the osculating circle of the parabola y = x^2 at the origin.

26. a) Find the net outward flux of the field F = $\frac{xi+yj+zk}{\rho^3}$, $\rho = \sqrt{x^2+y^2+z^2}$ across the boundary of the region D : $0 < a^2 \leq x^2+y^2+z^2 \leq b^2$.

 b) Verify the circulation form of green's theorem on the annular ring R :$h^2 \leq x^2 + y^2 \leq 1$, 0< h<1 , if M = $\frac{-y}{x^2+y^2}$, N = $\frac{x}{x^2+y^2}$.

27. Using Ferrari's method , solve $x^4 - 10x^2 - 20x - 16 = 0$.

28. a) Let e be an edge of the graph G and, let G-e be the subgraph obtained by deleting e. Then prove that $\omega(G) \leq \omega(G-e) \leq \omega(G) + 1$.

 b) Prove : An edge e of a graph G is a bridge if and only if e is not part of any cycle in G.

(2x15=30)