Reg.No..... Name:..... **U415**

BSc DEGREE END SEMESTER EXAMINATION MARCH 2016

SEMESTER – 4:

CORE COURSE FOR MATHS AND COMPUTER APPLICATIONS

COURSE: U4CRMAT04-U4CRCMT04 - VECTOR CALCULUS, THEORY OF EQUATIONS AND NUMERICAL METHODS

Time: Three Hours Max. Marks: 75

Part A

Answer **all** questions. Each question carries 1 mark.

1. Find the equation of a plane through (0, 2,-1) and normal to **n** = 3**i**-2**j**-**k.**
2. Find the angle between the planes $x+y=1$ and 2x + y – 2z = 2**.**.
3. Find the length of one turn of the helix r(t) = cost **i** + sint **j** + t **k**.
4. Find the gradient of $f(x,y)=\frac{x^2}{4}+y^2$ at (-2,1).
5. Check whether $ydx+xdy+4\,dz$ is exact
6. Is **F**= 12xz^2 **i** -9yz^2**j**-z^3**k**solenoidal?
7. State the fundamental theorem of algebra.
8. Find the minimum number of possible imaginary roots of $12x^7-x^4+10x^3-28=0$.
9. Give an example of a transcendental equation.
10. WriteNewton-Raphsonformula.

(1 x 10 = 10)

Part B

Answer any **eight** questions. Each question carries 2 marks.

11. Find the equation of a plane through (1,1,-1), (2,0,2),(0,-2,1).
12. Find the unit tangent vector to the curve $x=t^2+1, y=4t-3, z=2t^2-6t$ at a point t**.**
13. Find the derivative of $f(x,y)=x^2+xy$ at (1,2) in the direction of **i** + **j**.
14. Integrate $f(x,y,z)=x-3y^2+z$ over the line segment C joining the origin to the point (1, 1, 1).
15. Find the circulation of the field $F=(x-y)$ **i** $+x$ **j** around the circle $r(t)=(\cos t)$ **I** $+t$ **j**, $0\le t\le 2\pi$.
16. Check whether $F=(2x-3)$ **i** $-z$ **j** $+\cos z$ **k** is conservative?

17. Solve the equation $4x^3-24x^2+23x+18=0$,given that the roots are in arithmetic progression

18. If α,β,γ are the roots of $x^3+5x^2+3x+2=0$ .Find $\sum\frac{1}{\alpha}$.

19. Find a real root $x^3+x-1=0$ between 0 and 1 by Regula-falsi method.

20. Find an approximate root of the equation $x^3-9x+1=0$ between 2 and 3 by bisection method in four steps.

(2 x 8 = 16)

Part C

Answer any **five** questions. Each question carries 5 marks.

21. Find the normal and tangential scalar components of acceleration of the motion $r(t)=(\cos t+t\sin t)$ **i** $+(\sin t-t\cos t)$ **j** , t > 0.

22. Find the tangent plane and the normal line of the surface $f(x,y,z)=x^2+y^2+z-9=0$ at the point P_0 (1, 2, 4).

23. Use Green's Theorem to evaluate the integral, $\oint_C xydy-y^2dx$ where C is the square cut from the first quadrant by the lines x = 1 and y = 1.

24. Evaluate the integral $\iint_S (7xi-zk)\cdot nd\sigma$ over the sphere $S:\ x^2+y^2+z^2=4$ by divergence theorem.

25. Solve $24x^3-14x^2-63x+45=0$ given that one root is twice another root.

26. Find the equation whose roots are 2 less than the roots of the equation $x^4-5x^3+7x^2-4x+5=0$.

27. Find the root of the equation $x^3+x-1=0$ by iteration method near x = 1

(5 x 5 = 25)

Part D

Answer any **two** questions. Each question carries 12 marks.

28. Verify Stoke's theorem for the hemisphere $x^2+y^2+z^2=9, z\geq 0$, whose bounding circle is $x^2+y^2=9$, $z=0$ and the field **F** = y **i** – x **j.**

29. Find the area of the surface cap cut from the hemisphere $x^2+y^2+z^2=2, z\geq 0$ by the cylinder $x^2+y^2=1$.

30. Solve the equation $x^3-9x+28=0$ by Cardan's method·

31. Use Newton-Raphson method to obtain a root correct to 3 decimal places for the equation $x\sin x+\cos x=0$ near x = 3

(12 x 2 = 24)

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