CBCS SCHEME

USN 18INIAT11

# First Semester B.F. Degree Examination,,June/Jul:s 2019

## Calculus and Linear Algebra

Time: 3 hrs. Max. Marks: 100

*Note: Answer an;' FIVE full questions, choosing ONE full question from each module.*

### Module-1

1 a. With usual notation, prove that tan fi = r $\frac{de'}{dr}$ **(06 Marks)**

b. Find the radius of curvature of $a^2y = — a^3$ at the point where the curve cuts the x-axis. **(06 Marks)**

C. Show that the evolute of the parabola $y^2 = 4ax$ is $27ay^2 = 4(x – 20^3$. **(08 Marks)**

OR

2 a. Prove that the pedal equation of the curve r" = a"cosnO is $a^n.p = r^{n+1}$. **(06 Marks)**

b. Show that for the curve r( – cos0) = 2a, $p^2$ varies as C. **(06 Marks)**

C. Find the angle between the polar curves r = a( cos()) and r = + cos0). **(08 Marks)**

### Module-2

3 a. Expand log( I + cosx) by Maclaurin's series up to the term containing $x^4$. **(06 Nlarks)**

b. Evaluate lira x –O1 +b' +c' \ 3 **(07 Marks)**

c. Find the extreme values of the function tax, y) = $x^3 + y^3 – 3x – 12y + 20$. **(07 Marks)**

**OR**

4 a. If u = f x y z y z x j then prove that x • — + y 'eu + z • -- =0 **(06 Marks)**

b. If u x + 3y v 4x yz, w = 2z – xy. Evaluate $\frac{r(u,v,w)}{i)(x, y, z)}$ at the point (1, -I, 0). **(07 Marks)**

c. A rectangular box, open at the top, is to have a volume of 32 cubic feet. Find the dimensions of the box, if the total surface area is minimum. **(07 Marks)**

### Module-3

5 a. Evaluate by changing the order of integration

a x dy•dx a > 0 **(06 Marks)**

h. Find the area bounded between the circle $x^2 + y^2 = a^2$ and the line x + y = a. (07 Marks)

c. Prove that 13( m, m. n n **(07 Marks)**

OR

6 a. Evaluate 1 f f(x² + + ) dz.dy.dx (06 Marks)

b. **Find** the area bounded by the ellipse —-- — -1 by double integration. (07 Marks)

c. Show that dO x 1-N/sin 0.d0 Vs in 0 (07 Marks)

## Module-4

7 a. Solve (1 + e' )dx + e' Y, dy = 0 (06 Marks)

b. If the air is maintained at 30°C and the temperature of the body cools from 80°C to 60°C in 12 minutes_ Find the temperature of the body after 24 minutes. (07 Marks)

c. Solve $yp^2 + (x - y) p - x = 0$. (07 Marks)

OR

8 a. Solve $\frac{dy}{dx} + y \cdot \tan x = y \cdot \sec x$ (06 Marks)

b. Find the orthogonal trajectory of the family of the curves $r^n \cos n\theta = a^n$, where a is a parameter. (07 Marks)

c. Solve the equation ( px y) • (py + x) = 2p by reducing into Clairaut's form taking the substitution X = x², Y = (07 Marks)

## Module-5

9 a_ Find the rank of the matrix

A = -1 2 -2 3 / 5 -4 6 / -1 -3 2 -2 / 2 4 -1 6 by applying elementary Row transformations. (06 Marks)

b. Solve the following system of equations by Gauss-Jordan method:
x + y + z 9, 2x + y - z = 0, 2x + 5y + 7z = 52 (07 Marks)

c. Using Rayleigh's power method find the largest eigen value and corresponding eigen vecto of the matrix A = 0 1 / 0 2 0 / 0 2 with X(0) = (1, 0, 0)' as the initial eigen vector carry out 5 iterations. (07 Marks)

OR

10 a. For what values of r. and µ the system of equations.
x + y + z = 6, x+ 2y + 3z --- 10, x + 2y + Xy. p may have
i) Unique solution ii) Infinite number of solutions n ) No solution. (06 Marks)

b. Reduce the matrix A = $\begin{vmatrix} -1 & \\ 2 & 4 \end{vmatrix}$ into diagonal form. (07 Marks)

c. Solve the following system of equations by Gauss-Seidel method
20x + y - 2z = 17, 3x + 20y - z = -18, 2x 3y + 20z = 25. Carry out 3 iterations. (07 Marks)