CBCS SCHEME

USN 18INIAT11

of EMIIL"

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 $a^n.p = r''^{+1}$. **(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 –Ol +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

ax

x dy•dx a > O **(06 Marks)**

h. Find the area bounded between the circle $x^7 + y = a$ and the line x + y = a. (07 Marks)

c. Prove that 13(m, $\frac{m.n}{n}$ **(07 Marks)**

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OR

6 a. Evaluate $\int_{-b}^{c}\int_{-a}^{h} f(x^2 + \quad +) dz.dy.dx$ (06 Marks)

b. Find the area bounded by the ellipse —_- $\frac{}{a}$ __ -1 by double integration. (07 Marks)

c. Show that $\frac{dO\ x}{Vs\text{in }0}$ 1-N/sin 0.d0 (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 $\frac{dy}{dx} + y \bullet \tan x = y \bullet \sec x$ (06 Marks)

b. Find the orthogonal trajectory of the family of the curves r^n•eosn0 = 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 = x¯, Y = (07 Marks)

Module-5

9 a_ Find the rank of the matrix

$$A \quad \begin{matrix} 1 & 2 & -2 & 3 \\ & 5 & -4 & 6 \\ -1 & -3 & 2 & -2 \\ 2 & 4 & -1 & 6 \end{matrix}$$

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 $A = \begin{matrix} & 0 & 1 \\ 0 & 2 & 0 \\ & 0 & 2 \end{matrix}$ 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. andµ 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)

h. 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)