CBCS SCHEME

USN | | | | | | | | | | | 17MAT11

First Semester B.F. Degree Examination, Dec.2019/Jan.2020
Engineering Mathematics — I

Time: 3 hrs. Max. Marks: **100**

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-I

I a. Find the n^{th} derivative of sin 2x Cos X. **(06 Marks)**

b. Prove that the following curves cuts orthogonally r = a(1+ sin 0) and r = a(1— sin 0) . **(07 Marks)**

c. Find the radius of the curvature of the curve r = a sin nO at the pole. **(07 Marks)**

OR

2 a. If, tan y = x , prove that $(1 + x^2$ + 2(n +1)xy$_{ri+1}$ + n(n + 1)y$_{r,}$ = 0 . **(06 Marks)**

b. With usual notations, prove that tan(I) = $\frac{'WO}{dr}$. **(07 Marks)**

c. Find the radius of curvature for the curve n $^-$y = a($x^2 + y^2$) at (-2a, 2a). **(07 Marks)**

Module-2

3 a. Using Maclaurin's series prove that VI + sin 2x = +x x- $\frac{}{6}$ +$\frac{}{24}$---+.... **(06 Marks)**

b. If U = cot$^-$ $\left| \frac{x+y}{Ax + 3)} \right.$, prove that x $\frac{eli}{(x.}$ + y $\frac{ill}{a_y}$ = $\frac{1}{4}$ sin 2U. **(07 Marks)**

c. Find the Jacobian of u = $x^2 + y^- + z^-$, v = xy + yz +zx , w = x + y + z . **(07 Marks)**

OR

4 a. Evaluate lirn $\frac{\tan x}{x}$ r, **(06 Marks)**

b. Find the Taylor's sense of log(cos x) about the point x = $\frac{jr}{}$ upto the third degree. **(07 Marks)**

c. If u = f$\left(\frac{x}{y} \frac{y}{z} \frac{z}{x} \right)$ prove that x $\frac{cu}{ax}$ + y $\frac{}{ay}$ +z$\frac{Ou}{Oz}$ = . **(07 Marks)**

Module-3

5 a. If x = t^2 + 1, y = 4t — 3, z = $2t^2$ 6t represents the parametric equation of a curve then, find velocity and acceleration at t = 1. **(06 Marks)**

b. Find the constants a and b such that F = (axy + z^3)i+(3x^2 — z)j+(bxz^2 — y)k is irrotational. Also find a scalar function $_4$ such that F = V4. **(07 Marks)**

c. Prove that div(curl A) = 0 . **(07 Marks)**

OR

6 a. Find the component of velocity and acceleration for the curve r = 2t ˉi + t² - 4t)j+(3t -5)k at the points t = 1 in the direction of i -3 j+ 2k . **(06 Marks)**

b. If t = V(xy³z²) , find div t and curl t at the point (1, -I, **1).** **(07 Marks)**

c. Prove that curl(grad 4)) = **0.** **(07 Marks)**

Module-4

7 a. Prove that ˇ -____ dx = 3m using reduction formula. **(06 Marks)**
0 - x

b. Solve (x² + y + x)dx + xydy = 0 . **(07 Marks)**

c. Find the orthogonal trajectory of rn = a sin nO . **(07 Marks)**

OR

8 a. Find the reduction formula for icosn xdy and hence evaluate cos" xdx **(06 Marks.**
0

b. Solve ye" dx +(w" + 2y)dy = 0 . **(07 Marks)**

c. A body in air at 25°C cools from 100°C to 75°C **in 1 minute.** Find the temperature of the body at the end of 3 minutes. **(07 Marks)**

Module-5

9 a. Find the rank of the matrix A = $\begin{vmatrix} 2 & -1 & -3 & -1 \\ I & 2 & 3 & -1 \\ I & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{vmatrix}$ by reducing to row echelon form. **(06 Marks)**

b. Find the largest eigen and the corresponding eigen vector for $\begin{vmatrix} 4 & 1 & -1 \\ 2 & 3 & -1 \\ -2 & 1 & 5 \end{vmatrix}$ **by** taking the initial approximation as **[1,** 0.8, -0.81ˡ˙ by using power method. Carry out four iterations. **(07 Marks)**

c. Show that the transformation y ₁ = 2x₁ -2x₂ -x. y, = -4x₁ + 5x, + 3x,, y₁ = x, - x, -x₃ is regular. Find the inverse transformation. **(07 Marks)**

OR

10 a. Solve the equations 5x + 2y + z =12 , x + 4y + 2z =15 , x + 2y + 5z = 20 by using Gauss Seidal method. Carryout three iterations taking the initial approximation to the solution as (1, 0, 3). **(06 Marks)**

b. Diagonalize the matrix A = $\begin{vmatrix} & 3^- \\ & 4 \end{vmatrix}$ **(07 Marks)**

c. Reduce the quadratic form 8x² + 7y² +3z² -12xy + 4xz -8yz into canonical form by orthogonal transformation. (07 Marks)