Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**

PAM1A001

1st Semester Back Examination 2018-19

APPLIED MATHEMATICS-I

BRANCH : AEIE, AERO, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ENV, ETC, FAT, IEE, IT, MANUFAC, MANUTECH, MECH, METTA, MINERAL, MINING, MME, PE, PLASTIC, PT, TEXTILE

Max time : 3 Hours

Max Marks : 100

Q.CODE : E684

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 Short Answer Type Questions (Answer All-10) **(2 x 10)**

- **a)** Find the asymptotes parallel to X-axis of the curve $y^3+x^2y+2xy^2-y+1=0$
- **b)** Finds the points on the parabola $y=x^2$ where the radius of curvature is 4.
- **c)** What do you mean by integrating factor? How it helps to solve differential equations?
- **d)** What is the Wronskian? What role does it play in getting solution of a differential equation?
- **e)** What do you mean by general solution and particular solution of a differential equation? What is the practical significance of these two concepts?
- **f)** Define Cauchy's homogeneous linear equation.
- **g)** What is the rank of a matrix? Write its basic importance.
- **h)** Define Legendre equation and Legendre polynomial.
- **i)** Define a Unitary matrix and give examples.
- **j)** If α is an eigen value of an orthogonal matrix,then find its eigen value.

Part- II

Q2 Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) **(6 x 8)**

- **a)** Find the rank of the matrix A= $\begin{bmatrix} 1 & 2 & 3 \\ 3 & 4 & 5 \\ 4 & 6 & 8 \end{bmatrix}$.
- **b)** Show that the radius of curvature of any point of the asteroid $x = a\,cos^3\theta y = a\,sin^3\theta$, is equal to three times the length of the perpendicular from the origin to the tangent.
- **c)** Show that the eight points of intersection of the curve $xy(x^2-y^2)+x^2+y^2=a^2$, and its asymptotes lie on a circle whose center is at the origin.
- **d)** If $u=\sin^{-1}\left\{\frac{x+y}{\sqrt{x}+\sqrt{y}}\right\}$ show that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\frac{1}{2}\tan u$.
- **e)** Obtain Taylors series expansion of$\tan^{-1}(\frac{y}{x})$ about (1,1) up to and including the second degree.
- **f)** A rectangular box with square base and open top is to be made from 12 sq. feet of cardboard. What is the maximum possible volume of such a box?
- **g)** Solve the differential equation $\frac{dy}{dx}+x\,sin2y=x^3cos^2y$
- **h)** For what value ofμ, the equation $x+y+z=1$

  $$x+2y+4z=\mu$$
  $$x+4y+10z=\mu^2$$

  Has a solution and solve them completely in each case.
- **i)** Solve: $\frac{d^4y}{dx^4}-y=\cos x\,.\cosh x$
- **j)** Solve the differential equation $y''+y=x\,sinx$,by using variation of parameter method.

k) State and prove Rodrigues's Formula.

l) Solve: $y(x + y + 1)\,dx + x(x + 3y + 2)\,dy = 0$

Part-III

Long Answer Type Questions (Answer Any Two out of Four)

Q3 Find all the asymptotes of the cubic polynomial $x^3 - 2y^3 + xy(2x - y) + y(x - y) + 1 = 0$ and show that cut the curve in three point which lie on the straight line $x - y + 1 = 0$ **(16)**

Q4 Find the basis of eigenvectors and diagonalize the following matrix **(16)**

$$\begin{bmatrix} 18 & 0 & 0 \\ 24 & -4 & 0 \\ 42 & -12 & -2 \end{bmatrix}$$

Q5 **a)** Solve $(D^2 - 9)y = x + e^{2x} - \sin 2x$ **(16)**

b) Solve $(D^2 + 5D + 6)y = e^{-2x}\cosh 2x$

Q6 The Legendre polynomials $P_n(x)$ satisfy the following orthogonal property: **(16)**

a) $\int_{-1}^{1} P_n(x)P_m(x)\,dx = 0, n \neq m$

b) $\int_{-1}^{1} P_n^2(x)\,dx = \frac{2}{2n+1}$