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

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

15BS1101

1st Semester Back Examination 2018-19

MATHEMATICS-I

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

Time : 3 Hours

Max Marks : 100

Q.CODE : E806

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) Define polar formula of curvature.

b) Define an asymptote of the curve and when an asymptote does not exist?

c) What do you mean by integrating factor? How it helps to solve differential equations?

d) Define Euler's formula for homogeneous function of degree ***n***.

e) Define particular integral of differential equations of higher order with constant coefficient.

f) What is the basis of Eigen vector when does it exist?

g) What is the rank of a matrix? Write its basic importance?

h) Find the Legendre polynomial $P_1(x)$ and $P_2(x)$.

i) How can you say a real square matrix is orthogonal?

j) Explain the condition for which a system of linear equation will possess more than one solution.

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) Solve the equation $(1-x^2)\frac{d^2y}{dx^2}-x\frac{dy}{dx}+4y=0$,by power series method.

c) Reduce the equation $siny\frac{dy}{dx}=cosx(2cosy-sin2x)$ to a linear equation and hence solve it.

d) Solve the differential equation: $xy\frac{dy}{dx}=1+x+y+xy$.

e) Solve the differential equation:$y''-4y'+4y=e^x cosx$,where$y'=\frac{dy}{dx}$.

f) Solve the following differential equation

$(2x+3)^2y''-(2x+3)y'-12y=6x$, where$y'=\frac{dy}{dx}$.

g) Obtain the rectilinear asymptotes of the curve $r(e^\theta-1)=a(e^\theta+1)$

h) Find the Eigen values and Eigen vectors of the matrix $A=\begin{bmatrix}1 & 0 & -1\\ 1 & 2 & 1\\ 2 & 2 & 3\end{bmatrix}$

i) Solve: $(D^2+6D+8)y=x+e^{2x}+\sin 2x$

j) Solve the differential equation $y'' + y = cosec\, x$,by using variation of parameter method.

k) Prove that the center of curvature at points of a cycloid lie on an equal cycloid.

l) Solve: $\left(y\left(1+\frac{1}{x}\right)+\cos y\right)dx+(x+\log x-x\sin y)\,dy=0$

Part-III

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

Q3 Find the point of the curve $y = e^x$,at which the curvature is maximum and show that the tangent at the point forms with the axes of co-ordinates a triangle whose sides are in the ratio $1:\sqrt{2}:\sqrt{3}$. **(16)**

Q4 Similar matrices have equal spectra verify this for A and $B = P^{-1}AP$,Where **(16)**

$$A=\begin{bmatrix}10 & -3 & 5\\ 0 & 1 & 0\\ -15 & 9 & -10\end{bmatrix},P=\begin{bmatrix}2 & 0 & 3\\ 0 & 1 & 0\\ 3 & 0 & 5\end{bmatrix}$$

Q5 **a)** Solve the differential equation by using method of undetermined coefficient : $(D^2+16)y = x + 16\sin 4x$. **(8)**

b) Solve $(D^2+5D+6)y = e^{2x}\sinh 2x$ **(8)**

Q6 State and prove Rodrigues formula and hence derive $P_4(x)$. **(16)**