Registration No : | 2 | 2 | 0 | 1 | 2 | 1 | 4 | 0 | 6 | 5 |

Total Number of Pages : 02

B. Tech /
Integrated Dual Degree (B. Tech & M.Tech)
RMA1A001

1st Semester Regular/Back Examination: 2022-23
Mathematics - I
BRANCH(S): All branches
CE, CSE, ECE, EE, ME (Integrated Dual Degree)
Time : 3 Hour
Max Marks : 100
Q.Code : L646

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 **Answer the following questions :** (2 x 10)

a) Find the asymptotes of the curve $y = \frac{x^2}{x^2+1}$ parallel to the x-axis

b) What is the curvature of the circle $x^2 + y^2 = 4$ at the point (2, 0)?

c) What is the value of $\beta(2,3)$?

d) When the differential equation $M(x,y)dx + N(x,y)dy = 0$ is exact?

e) Solve the differential equation $\frac{dy}{dx} = \sin x$.

f) Write the solution of a 2nd order homogeneous ODE if the roots of the auxiliary (characteristic) equation are $\lambda = 1+2i \ \& \ 1-2i$.

g) Let the roots of the auxiliary (characteristic) equation of $y''+ay'+by=e^{2x}$ are 2 and 3. Then what is the choice for $y_p(x)$ for this equation?

h) Under what conditions a function $f(t)$, defined for $t>0$ will have a Laplace transform?

i) What is the Laplace transform of the unit step function $u(t-a)$?

j) What is Laplace inverse of $\frac{1}{(s-1)(s-2)}$?

Part-II

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

a) Find all the asymptotes of the curve $y(y-1)^2 - x^2 y = 0$.

b) Show that $3\sqrt{3}/2$ is the least value of the $|\rho|$ for $y = \ln x$.

c) Show that $\beta(p+1,q) + \beta(p,q+1) = \beta(p,q)$.

d) Solve $xy' = \frac{1}{2}y^2 + y$.

e) Solve $x^3y' + 3x^2y - 1 = 0,\ y(1) = -1$.

f) Solve $y'' - 2y' - 3y = 0,\ y(0) = 2,\ y'(0) = 14$

g) Solve $y'' - 4y' + 4y = x^2e^x$.

h) Solve $y' = y + x$ by power series method.

i) Show that $J_0'(x) = -J_1(x)$.

j) Solve $y'' + 2y' + 2y = 0,\ y(0) = 1,\ y'(0) = -3$ by Laplace transform.

k) Find out the given convolution. $\sin t * \cos t$.

l) Solve the integral equation $y(t) + \int_0^t (t - \tau)y(\tau)d\tau = 1$.

Part-III

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

Q3 Find the absolute maxima and minima of the function $f(x, y) = x^2 + xy + y^2 - 6x + 2$ on the rectangular region $0 \le x \le 5$, $-3 \le y \le 0$. (16)

Q4 Solve $y'' + 4y = 16\cos 2x,\ y(0) = 0,\ y'(0) = 0$ (16)

Q5 Solve $y'' - y' + xy = 0$ by power series method. (16)

Q6 Solve $y'' + 2y' + 2y = e^{-t} + 5\delta(t - 2),\ y(0) = 0,\ y'(0) = 1$ (16)

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

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

RMA1A001

1st Semester Regular/Back Examination 2019-20

MATHEMATICS –I

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

Max Marks : 100

Time : 3 Hours

Q.CODE : HRB563

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

a) What is the practical significance of general solution and particular solution of a differential equation?

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

c) Find the parallel asymptotes of $y^2 x - a^2(x-a)=0$

d) What is the relation between curvature and radius of curvature of the curve?

e) What is the Wronskian? What role does it play in getting solution of a differential equation.

f) Write the Generating function of Legendre'sPolynomial

g) Prove that $\beta(m,n)=\beta(n,m)$

h) What does the convergence of a power series means? Why is it important?

i) Write down Second sifting theorem for Laplace transform and inverse Laplace transform with examples.

j) State convolution theorem.

Part-II

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

a) 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

b) Solve the following differential equation $(2x+3)^2y''-(2x+3)y'-12y=6x,$ where$y'=\frac{dy}{dx}$.

c) Prove that $L^{-1}\left(\frac{s^2}{s^4+a^4}\right)=\frac{1}{2a}(\text{coshat sinat}+\text{sinhat cosat})$

d) Find the Laplace Transform of $f(t)=\left(\frac{1-e^{-t}}{t}\right)$

e) . Express $J_{\frac{7}{2}}(x)$ in terms of sine and cosine functions.

f) Solve the differential equation: $(D^2+6D+8)y=e^{-2x}.\sin 2x$

g) Solve the differential equation $\frac{dy}{dx}+x\sin 2y=x^3\cos 2y$

h) Solve: $(x^2y-2xy^2)dx-(x^3-3x^2y)dy=0$

i) Solve the equation (1-x^2) $\frac{d2y}{dx2}$-$x\frac{dy}{dx}+4y=0$, by power series method

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

k) Solve the differential equation by using method of undetermined coefficient : $(D^2 + 6D + 8)y = x + e^{-2x} + \cos 2x$.

l) Solve the differential equation $y'' + y = xsinx$, by using variation of parameter method.

Part-III

Only 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 State and prove Rodrigues formula and hence derive $P_4(x)$,in terms of Polynomial Function. **(16)**

Q5 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)**

Q6 Solve the differential equation using Laplace transform $y'' + 4y' + 4y = 6e^{-t}, y(0) = -2, y'(0) = 8$. **(16)**

Total Number of Pages : 02

B.Tech
RMA1A001

1st Semester Regular / Back Examination: 2021-22
MATHEMATICS-I
BRANCH(S): AEIE, AERO, AG, AME, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CSE, CSEAI, CSEAIME, CST, ECE, EEE, EIE, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E, ENV, ETC, IT, MANUTECH, MECH, METTA, MINERAL, MINING, MME, PE, PLASTIC, PT

Time : 3 Hour
Max Marks : 100
Q.Code : OF596

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 **Answer the following questions :** **(2×10)**

a) Find the asymptotes, parallel to the axis of x of the curve
$y^4 + x^2y^2 + 2x^2y + 2xy^2 - 4x^2 - y + 1 = 0.$

b) Find the radius of curvature for the catenary $s = c\tan\psi$.

c) How Beta and Gamma functions are related?

d) Find the Wronskian $W(x^4, x^4 \ln x)$.

e) Define Bernoulli differential equation.

f) What is exact differential equation?

g) Write the Legendre polynomial of degree three.

h) Find the integrating factor of the differential equation $y\,dx + (x^2y - x)dy = 0.$

i) Find the inverse Laplace transformation of the function $\frac{7}{(s-1)^3}$.

j) Find the convolution $t * e^t$ by integration.

Part-II

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

a) Find all the asymptotes of
$y^3 - x^2y - 2xy^2 + 2x^3 - 7xy + 3y^2 + 2x^2 + 2x + 2y + 1 = 0.$

b) Evaluate the integral $\int_0^\infty e^{-ax}\cos bx\,dx$ using Gamma function.

c) Solve the following ordinary differential equation by method of variation of parameter: $\frac{d^2y}{dx^2} + y = \cos x + \sec x.$

d) Find the maxima and minima of the function
$f(x,y) = 21x - 12x^2 - 2y^2 + x^3 + xy^2.$

e) Solve the differential equation $\frac{d^2y}{dx^2} - y = 2e^{-x}$.

f) Find the value of ρ for the curve $x - s\cos\left(\frac{s}{a}\right), y - a\sin\left(\frac{s}{a}\right).$

g) Solve the ordinary differential equation $x^2\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + 6y = 0.$

h) Find the indicial equation of the Bessel's differential equation $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x^2 - v^2)y = 0$.

i) Solve the differential equation $\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} + 2y = 0$ by power series method.

j) Using Laplace transform, solve the initial value problem:
$\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 8y = e^{-3t} - e^{-5t}, y(0) = 0 = y'(0).$

k) Using Laplace transform solve the integral equation
$$y(t) = te^t - 2e^t\int_0^t e^{-\tau}y(\tau)d\tau.$$

l) Using convolution, find inverse $f(t)$ of $F(s) = \frac{s}{(s^2+\pi^2)^2}$.

Part-III

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

Q3 Show that the following improper integral is convergent: **(16)**
$$\int_0^1 t^{x-1}(1-t)^{y-1}dt, x > 0, y > 0.$$

Q4 Determine the characteristic (auxiliary) equation of the second order Euler Cauchy type ordinary differential equations. Solve the initial value problem **(16)**
$x^2\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} + y = 0,\ y(1) = 4, y'(1) = -2.$

Q5 Obtain Legendre polynomial of degree n, from the Legendre differential equation **(16)**
$(1-x^2)\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + m(m+1)y = 0, m$ is given constant.

Q6 Solve the initial value problems **(16)**
$$\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 2y = \begin{cases} 1, 0 < t < a \\ 0, t > a \end{cases}, y(0) = 0 = y'(0).$$

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Total Number of Pages : 02 **B.Tech**
BS1101

1st Semester Back Examination 2019-20
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 : 70
Q.CODE : HB709
Answer Question No.1 which is compulsory and any FIVE from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions :** **(2 x 10)**

a) Define rectilinear Asymptotes.
b) Define homogeneous and non-homogeneous differential equation
c) What do you mean by integrating factor? How it helps to solve differential equations?
d) Define curvature and center of Curvature
e) Define Cauchy's homogeneous linear Differential equation
f) Define a Unitary matrix and give examples
g) What is the rank of a matrix? Write its basic importance?
h) Define Legendre equation and Legendre polynomial
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.

Q2 **a)** Find the rank of the matrix $A=\begin{bmatrix} 4 & 2 & 3 \\ 8 & 4 & 6 \\ -2 & -1 & -1.5 \end{bmatrix}$. **(5)**

b) Find the Eigen values and Eigen vectors of the matrix $A=\begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ **(5)**

Q3 **a)** Solve the equation $(1+x^2)\frac{d^2y}{dx^2}+x\frac{dy}{dx}+4y=0$, by power series method. **(5)**

b) Reduce the equation $siny\frac{dy}{dx}=cosx(2cosy-sin2x)$ to a linear equation and hence solve it. **(5)**

Q4 **a)** Solve the differential equation: $xy\frac{dy}{dx}=1+x+y+xy$. **(5)**

b) Solve the differential equation: $y''+4y'+4y=e^x sin2x$, where $y'=\frac{dy}{dx}$. **(5)**

Q5 **a)** Solve the differential equation $y''+y=xsinx$, by using variation of parameter. **(5)**

b) Solve the differential equation, $\frac{dy}{dx}+x\,sin2y=x^3cos2y$ **(5)**

Q6 **a)** Show that the radius of curvature of any point of the asteroid $x=a\cos^3 t, y=a\sin^3 t$ is equal to three times the length of the perpendicular from the origin to the tangent **(5)**

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

Q7 **a)** Solve: $\left(y\left(1+\frac{1}{x}\right)+\cos y\right)dx + (x + \log x - x\sin y)dy = 0$ **(5)**

b) Solve the following system of linear equation by Gauss elimination method: $10x + y + z = 12,\ x + 10y + z = 12,\ x + y + 10z = 12.$ **(5)**

Q8 **Write short Notes on any TWO :** **(5 x 2)**

a) Exact Differential Equation

b) Bessel's Equation

c) Linear independent and linear dependent.

d) LU-Decomposition

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

Total Number of Pages: 02 **B.Tech**
BS1101

1th Semester Back Examination 2017-18
MATHEMATICS - I
BRANCH: AEIE, AERO, AUTO, CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ETC, FASHION, IEE, IT, MANUTECH, MECH, METTA, MINING, MME, PE, PLASTIC
Time: 3 Hours
Max Marks: 70
Q.CODE: B756
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions:** **(2 x 10)**

a) Find the Radius of convergence of $\sum_1^\infty \frac{x^{3n}}{8^n}$?

b) Find the radius of curvature to the circle $x^2 + y^2 = 16$?

c) Find the integrating factor of 2cosy – siny dy=0?

d) Define rank of the matrix?

e) Write the differential equations whose solutions are $e^x and\ e^{2x}$?

f) Evaluate $(\frac{3}{2})$?

g) Prove that product of two unitary matrix is unitary?

h) Find the General solutions of $(D^2 - 1)y = 0$; D = $\frac{d}{dx}$?

i) Check whether the vector (1, 2,0), (1,1,1), (2,2,2) and (0,0,0) are Linearly independent or linearly dependent?

j) Find Asymptotes parallel to both the axis of the curve $y^3x + x^4 + 2xy + 1 = 0$

Q2 **a)** Find the radius of curvature at any point x = $\frac{\pi}{4}$ of the curve y = $4\sin 2x - \sin 4x$? **(5)**

b) Find all asymptotes of the curve $x^2 + 3xy + 2y^2 + 3x - 2y + 1 = 0$? **(5)**

Q3 **a)** Prove the Rodrigue's formula ? **(5)**

b) Prove that $J_{-o.5}(x) = \sqrt{\frac{2}{\pi x}}\cos x$, $j_n(x)$ be the Bessel's functions **(5)**

Q4 **a)** Solve $\frac{dy}{dx} + \frac{y}{x} = \frac{y^2}{x}\log x$ **(5)**

b) Solve the initial value problem $\frac{dy}{dx} + y\cos x = \sin 2x, y(\pi) = 0)$ **(5)**

Q5 **a)** By using method of undetermined coefficient solve $(D^2 - 3D + 2)$y = $e^x + e^{2x}$; $D = \frac{d}{dx}$? **(5)**

b) Solve $y'' - 4y' + 5y = e^x cosec\, x$ by method of variation of the parameter? **(5)**

Q6 **a)** Find the rank of the matrix A = $\begin{bmatrix} 3 & 1 & 4 \\ 0 & 4 & 4 \\ -3 & 4 & 4 \end{bmatrix}$? **(5)**

b) Solve the system of linear equations 4y + 3z = 8 , 2x – z = 2 , 3x + 2y = 5 by Gauss elimination method? **(5)**

Q7 **a)** Diagonalize the matrix P = $\begin{bmatrix} 2 & 1 \\ 2 & 1 \end{bmatrix}$ **(5)**

b) Find the type of conic section represented by the quadratic form $4x^2 + 12xy + 13y^2 = 16$? **(5)**

(5)

Q8 **a)** Solve the initial value problem $x^2y'' - xy' + y = \ln x$, y(1) = 3 , $y'(1) = 0$?

b) Prove that the eigenvalues of a hermitian matrix are real ? **(5)**

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

15BS1101

1st Semester Back Examination 2019-20

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

Max Marks : 100

Time : 3 Hours

Q.CODE : HB708

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

a) Define rectilinear Asymptotes.

b) Define homogeneous and non-homogeneous differential equation.

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

d) Define curvature and center of Curvature.

e) Define Cauchy's homogeneous linear Differential equation.

f) Define a Unitary matrix and give examples.

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

a) Find the rank of the matrix $A=\begin{bmatrix} 4 & 2 & 3 \\ 8 & 4 & 6 \\ -2 & -1 & -1.5 \end{bmatrix}$

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: $y''+4y'+4y=e^x sin2x$, 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 $A=\begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$

i) Solve the differential equation, $\frac{dy}{dx}+x\,sin2y=x^3cos2y$

j) Solve the differential equation $y''+y=cot\,x$, 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

Only 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)**

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

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

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

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

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Total Number of Pages: 02 **B.Tech**
15BS1101

1st Semester Back Examination 2017-18
MATHEMATICS-I
BRANCH: AEIE, AERO, AUTO, BIOTECH, CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ETC, FAT, IEE, IT, MANUTECH, MECH, METTAMIN, MINERAL, MINING, MME, PE, PLASTIC, TEXTILE
Time: 3 Hours
Max Marks: 100
Q.CODE: B755

Answer Question No.1 and 2 which are compulsory and any four from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions: *multiple type or dash fill up type*** **(2 x 10)**

a) The asymptote to the curve $x^2y + xy^2 = 0$ parallel to x-axis is
(a)y =1 (b)y = 0 (c) x = 0 (d) none?

b) Let $J_n(x)$ be the Bessel function then the value of $J_n(0)$ is _____

c) The degree of $(1 + y'')^{\frac{3}{2}} = (xy' + 5)$ is _____

d) Let A = $[a_{IJ}]$ be a 3× 3 matrix such that $a_{ij} = 1$ for all I and j, then characteristics polynomial of A is _____

e) The eigenvalues of idempotent matrix are _____

f) If Trace(A)=3 Then the value of the Trace(A^T) is _____

g) The Radius of curvature of the curve y = $x^3 + e^{2x}$ at the point (1 , 1) is _____

h) Let $p_n(x)$ be the Legendre polynomial then the value of $p_n(-1)$ is ____

i) The vector (1, 2,0),(1,1,1),(2,2,2) and (0,0,0) are
(a)linearly independent (b)linearly dependent (c) both a and b (d)none ?

j) The integrating factor of y (1+xy) dx + x(1- xy)dy is _____

Q2 **Answer the following questions: *Short answer type*** **(2 x 10)**

a) Find the Algebraic and Geometric multiplicity of A= $\begin{bmatrix} 2 & 2 & 2 \\ 2 & 2 & 2 \\ 2 & 2 & 2 \end{bmatrix}$ with respect to the eigenvalue 0?

b) Find the Radius of curvature for the pedal curve $p^3 = 2ar$

c) Find the Radius of convergence of $\sum_1^\infty \frac{n}{(n+1)!}x^n$?

d) Solve $(x^3D^3 - 3x^2D^2 + 6xD - 6)y = 0$?

e) What is the integrating factor of $y' + y = xy^3$?

f) Solve $(D^4 + 1)\, y = 0$?

g) Solve the ordinary differential equation $(D^2 + 1)((D-5)^3 y = 0; D = \frac{d}{dx}$

h) Find the asymptotes to the curve $2x^4y + 3y^4x + x^2y + xy^2 = 0$ which are parallel to the axis?

i) Define rank of a matrix and what is the rank of a sum of the identity matrix and null matrix of order 3 X 3?

j) Let A = $[a_{IJ}]$ be a 3× 3 matrix such that det(A - I) = 0 ,Where I be a 3× 3 identity matrix . If Trace(A) = 13, det(A) = 36 Then find the sum of the square of the eigenvalues ?

Q3 **a)** Find all the asymptotes of the curve $3x^3 + 2x^2y - 7xy^2 + 2y^3 - 14xy + 7y^2 + 4x + 5 = 0$? **(10)**

b) Find the radius of curvature for the curve a = $r(1 + \cos\theta)$? **(5)**

Q4 **a)** Prove that $J_{-o.5}(x) = \sqrt{\frac{2}{\pi x}}\cos x$, $j_n(x)$ be the Bessel's functions? **(10)**

b) Evaluate the value of $(\frac{9}{2})$? **(5)**

Q5 **a)** Solve $(D^2 + 4)y = 2\tan x$; x>0 , D=$\frac{d}{dx}$? **(10)**

b) Find the second linear independent solution of $y'' - \frac{2}{x^2}y = 0$ **(5)**
While one solution is x^2 ?

Q6 **a)** Find the series solution of $y'' - xy' - 2y = 0$ about x= 0? **(10)**

b) State and Prove the Rodrigue's formula ? **(5)**

Q7 **a)** Show that (n+1)$p_{n+1}(x) = (2n + 1)xp_n(x) - np_{n-1}(x)$;n≥ 1 ? **(10)**

b) Prove that $\int_{-1}^{1} p_m(x)p_n(x)dx = 0$ if m≠ n ? **(5)**

Q8 **a)** Find eigenvalue and eigenvector of A= $\begin{bmatrix} 3 & 0 & 0 \\ 2 & 6 & 0 \\ 4 & 2 & 12 \end{bmatrix}$? **(10)**

b) Prove that inverse of unitary matrix is unitary ? **(5)**

Q9 **a)** Solve $(2xy^4e^y + 2xy^3 + y)\,dx + (x^2y^4e^y - x^2y^2 - 3x)\,dy = 0$ **(10)**

b) Find the current at any time t>0 in a circuit having in series a constant electromotive force 40 v ,a resistor 10Ω and an inductor 0.2H given that initial current is zero ? **(5)**

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

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PAM1A001

1st Semester Back Examination 2019-20
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 Marks : 100
Time : 3 Hours
Q.CODE : HB562

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

a) What is the practical significance of general solution and particular solution of a differential equation?
b) What do you mean by integrating factor? How it helps to solve differential equations?
c) Find the parallel asymptotes of $y^2 x - a^2(x-a)=0$
d) What is the relation between curvature and radius of curvature of the curve?
e) What is the Wronskian? What role does it play in getting solution of a differential equation.
f) Write the Generating function of Legendre'sPolynomial
g) If α is an eigen value of an orthogonal matrix,then find its eigen value
h) What does the convergence of a power series means? Why is it important?
i) Write down the Lagrange sufficient condition for a function of two variable to attain a minimum value ?
j) Find the radius of curvature for the pedal curve ?

Part-II

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

a) 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
b) Solve the following differential equation
$(2x + 3)^2 y'' - (2x + 3)y' - 12y = 6x$, where $y' = \frac{dy}{dx}$.
c) Obtain Taylors series expansion of $\tan^{-1}(\frac{y}{x})$ about (1,1) up to and including the second degree.
d) Find the following information regarding the linear system of Equation.

$$2x + 3y - z = 0$$
$$5x - 3y + z = 7$$
$$8x + 9y - 3z = 2$$

(i) Find the Solution by using Gauss Elimination Method.
(ii) Find the rank of the co-efficient matrix

e) Express $J_{\frac{7}{2}}(x)$ in terms of sine and cosine functions.
f) Solve the differential equation: $(D^2 + 6D + 8)y = e^{-2x}.\sin 2x$
g) Solve the differential equation $\frac{dy}{dx} + x\sin 2y = x^3 \cos 2y$

h) Solve: $(x^2y - 2xy^2)dx - (x^3 - 3x^2y)dy = 0$

i) Solve the equation $(1-x^2)\frac{d2y}{dx2} - x\frac{dy}{dx} + 4y = 0$, by power series method

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

k) Solve the differential equation by using method of undetermined coefficient: $(D^2 + 6D + 8)y = x + e^{-2x} + \cos 2x$.

l) Solve the differential equation $y'' + y = xsinx$,by using variation of parameter method.

Part-III

Only 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 State and prove Rodrigues formula and hence derive $P_4(x)$, in terms of Polynomial Function. **(16)**

Q5 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)**

Q6 Find a basis of Eigenvectors and diagonalizable the following matrix $\begin{bmatrix} 18 & 0 & 0 \\ 24 & -4 & 0 \\ 42 & -12 & 2 \end{bmatrix}$ **(16)**

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

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

PAM1A001

1st Semester Regular / Back Examination 2017-18

APPLIED MATHEMATICS-I

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

Time: 3 Hours

Max Marks: 100

Q.CODE: B733

Answer Question No.1 and 2 which are compulsory and any four from the rest.

The figures in the right hand margin indicate marks.

Q1 **Answer the following questions: *multiple type or dash fill up type*** **(2 x 10)**

a) The Asymptote of a n'th degree curve cuts the curve into
a) n points (b) n(n-1) points (c) n(n-2) points (d) None ?

b) The number of asymptotes of a curve of n'th degree is
a) Atleast one (b) Atleast n (c) Atmost n (d) None

c) The sum of order and degree of the differential equation
$\frac{d^2}{dx^2}(y'' + 1) + 2y' = 0$ is
a) 2 (b) 3 (c) 4 (d) 5

d) Let A = $[a_{IJ}]$ be a 2017× 2017 matrix such that $a_{ij} = \alpha$ for all I and j , then characteristics polynomial of A is
a)$x^{2015}(x - 2017\ \alpha)$ (b) $x^{2016}(x - 2017\alpha)$ (c) $x^2(x - 2017\alpha)$ (d) None

e) Let $A^* = A^{-1}$; Where $A^* = (\overline{A})^T$ Then eigen values of A are
a) $\lambda = \pm 1$ (b) $\lambda = \pm i$ (c) $|\lambda| = 1$ (d) λ=± 2 ?

f) If Trace(A)=3 and Trace(P)= 5,Then Trace($P^{-1}AP$);where P is an invertible matrix, Is equal to
a)2 (b) 4 (c) 5 (d) 3

g) The Radius of curvature of the curve y = e^x at the point (0 , 1) is
a) 2√2 (b) 3√2 (c) 0 (d) None

h) Let $p_n(x)$ be the Legendre polynomial then $p_n'(1)$
a) 0 (b) 1 (c) $\frac{n(n-1)}{2}$ (d) $\frac{n(n+1)}{2}$

i) Let A = $[a_{IJ}]$ be a n× n matrix such that rank of A = r ,then number of linearly independent solutions of the homogeneous system of equations Ax =0 is
a) n -1 (b) n – r (c) $n + r$ (d) n – r + 1

j) What is the integrating factor of (2y dx + 3x dy) + 2xy(3ydx + $4x\ dy$)
a) x^2y (b) xy (c) xy^2 (d) None

Q2 **Answer the following questions: *Short answer type*** **(2 x 10)**

a) Find the Algebraic and Geometric multiplicity of A= $\begin{bmatrix}1 & 1 & 1\\1 & 1 & 1\\1 & 1 & 1\end{bmatrix}$ with respect to the eigenvalue 1?

b) Find the Radius of curvature for the pedal curve $p^2 = ar$

c) Find the Radius of convergence of $\sum_1^\infty 5^n x^{n+2}$?

d) Solve $(x^3D^3 - 3x^2D^2 + 6xD - 6)y = 0$?

e) What is the integrating factor of $y' + p(x)y = q(x)y^n$; n≠ 0,1 ?

f) Write down the Lagrange sufficient conditions for a function of two variable to attain a minimum value ?

g) Solve the ordinary differential equation (D + 1)($(D - 2)^3 y = 0; D = \frac{d}{dx}$

h) Find the asymptotes to the curve $x^4 + y^4 + x^2y + xy^2 = 0$ which are parallel to the axis ?

i) Define Similar Matrices.

j) Let A = $[a_{IJ}]$ be a 3× 3 matrix such that det(A - I) = 0 ,Where I be a 3× 3 identity matrix . If Trace(A) = 13, det(A) = 36 Then find the sum of the square of the eigenvalues ?

Q3 **a)** Find all the asymptotes of the curve **(10)**
$4x^4 - 13x^2y^2 + 9y^4 + 32yx^2 - 42y^3 - 20x^2 + 74y^2 + 16 = 0$

b) Find the radius of curvature for the curve r = $a(1 - \cos\theta)$ **(5)**

Q4 **a)** Find the extrema of the function f(x,y)= $x^3y^2(1 - x - y)$ **(10)**

b) Expand f(x, y)= $(2x + y)^2$ about the point (x, y)=(1,1) by the Taylor series method . **(5)**

Q5 **a)** Using method of variation of parameter solve $x^2y'' + xy' - y = x^2e^x$? **(10)**

b) Find the second linear independent solution of $xy'' - (x + 1)y' + y = 0$ While one solution is e^x ? **(5)**

Q6 **a)** Find the series solution of $y'' + xy' + x^2y = 0$ about x= 0? **(10)**

b) Prove that $np_n(x) = xp_n'(x) - p_{n-1}'(x)$; where $p_n(x)$ is the Legendre polynomial. **(5)**

Q7 **a)** Show that $np_n(x) = (2n - 1)xp_{n-1}(x) - (n - 1)p_{n-2}(x)$;n≥ 2 ? **(10)**

b) Prove that $\int_{-1}^{1} p_m(x)p_n(x)\,dx = 0$ if m≠ n ? **(5)**

Q8 **a)** Find eigenvalue and eigenvector of A= $\begin{bmatrix} 1 & 0 & 0 \\ 2 & 4 & 0 \\ 4 & 2 & 8 \end{bmatrix}$? **(10)**

b) Prove that product of two unitary matrix is unitary ? **(5)**

Q9 **a)** Solve $(1+y^2)dx = (\tan^{-1} y - x)\,dy$ **(10)**

b) Find the current at any time t>0 in a circuit having in series a constant electromotive force 40 v ,a resistor 10Ω and an inductor 0.2H given that initial current is zero. **(5)**