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 $\frac{dy}{dx}+x\,sin2y=x^3cos2y$

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 $y'' + y = x\sin x$, 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)**