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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fourth Semester, B.E. - Semester End Examination; Sep. / Oct. - 2023

Applied Mathematical Methods

(Common to AU, CV, IP and ME)

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Apply the concepts of an analytic function and their properties to solve the problems arising in engineering field

CO2: Use the concept of correlation and regression analysis to fit a suitable mathematical model for the statistical samples arise in engineering field

CO3: Explain various numerical techniques to solve equations approximately having no analytical solutions.

CO4: Interpret discrete and continuous probability distributions in analyzing the probability models and solve problems involving Markov chains

CO5: Estimate the series solutions of ordinary difference equation.

***Note**: **I) PART - A** is compulsory. **Two** marks for each question.*

***II) PART - B**: Answer any **Two** sub questions (from a, b, c) for a Maximum of **18 marks** from each unit.*

Q. No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
1 a.	Define analytic function.	2	L1	CO1	PO1
b.	Write Karl Pearson's coefficient of correlation formula.	2	L1	CO2	PO1
c.	Write Runge Kutta method of fourth order formula.	2	L1	CO3	PO1
d.	State Binomial distribution.	2	L1	CO4	PO1
e.	Write the Bessel's differential equation.	2	L1	CO4	PO1
	II : PART - B	**90**			
	UNIT - I	**18**			
2 a.	Show the $u = e^x$ $(xcosy - ysiny)$ is harmonic and find its harmonic conjugate. Also determine the corresponding analytic function.	9	L2	CO1	PO2
b.	Show the $w = z + e^z$ is analytic and hence find $\frac{dw}{dz}$.	9	L2	CO1	PO1
c.	Define conformal transformation. Find the bilinear transformation which map the points $Z = 1, i, -1$ into $w = i, 0, -i$.	9			
	UNIT - II	**18**			
3 a.	Expand $f(z) = \frac{1}{(z-1)(2-z)}$ as a Laurent series valid for; i) $\lvert Z \rvert < 1$ ii) $1 < \lvert Z \rvert < 2$	9	L2	CO2	PO1
b.	Fit parbola $y = ax^2+bx+c$ by the method of least squares for the data	9	L2	CO2	PO2

x	0	1	2	3	4
y	1	1.8	1.3	2.5	2.3

Contd....2

c. Calculate the coefficient of correlation and obtain the lines of regression for the following data:

x	1	2	3	4	5	6	7	8	9
y	9	8	10	12	11	13	14	16	15

Obtain an estimate for y which corresponds to $x = 6.2$

9 L1 CO2 PO2

UNIT - III **18**

4 a. Write Newton-Raphson's iterative formula for X_{n+1}.

Using Regular-Falsi method find the approximate root of the equation $xe^x = cosx$ that lies between 0.4 and 0.6 (x is in radians) correct to 4 decimal places.

9 L2 CO3 PO2

b. Given, $\frac{dy}{dx} = 3x + \frac{y}{2}$, $y(0) = 1$. Compute $y(0.2)$ by taking $h = 0.2$ using Runge Kutta method of fourth order.

9 L2 CO3 PO1

c. Employ Gauss-Seidel iteration method to solve $5x + 2y + z = 12$, $x + 4y + 2z = 15$, $x + 2y + 5z = 20$ carryout 4 iterations taking the initial approximation to the solution as (1, 0, 3).

9 L1 CO3 PO1

UNIT - IV **18**

5 a. The probability distribution of a finite random variable x is given by the following table:

x_i	-2	-1	0	1	2	3
$P(x_i)$	0.1	K	0.2	$2k$	0.3	K

9 L2 CO4 PO2

i) Find the value of K and calculate the mean and variance

ii) Find P($x < 1$), P ($-1 < x \leq 2$) P ($x > -1$)

b. Write the formula of mean and standard deviation in Poison's distribution. The probability that a mean aged 60 will live to be 70 is 0.65. What is the probability that out of 10 men, now aged 60, at least 7 will live to be 70?

9 L3 CO4 PO2

c. A coin is tossed three times. Let x denote 0 or 1 according as a tail or a head occurs on the first toss. Let y denote the total number of tails which occur. Determine;

i) The joint distribution of x and y

ii) Marginal distribution of x and y

iii) E(x+y) and E(xy)

9 L2 CO4 PO1

UNIT - V **18**

6 a. Find the power series solution of $(1-x^2)\,y'' - 2xy' + 2y = 0$ about $x = 0$. 9 L2 CO4 PO1

b. Solve the Bessel's differential equation $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x^2 - n^2)y = 0$. 9 L3 CO4 PO2

c. Express $x^3 + 2x^2 - 4x + 5$ in terms of Legendre's polynomials. 9 L3 CO4 PO2

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