GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, ODISHA, GUNUPUR
(GIET UNIVERSITY)

B. Tech (Third Semester - Regular) Examinations, November – 2024

23BBSBS23001 – Engineering Mathematics-III

(CHE, CIVIL, EE, EEE, MECH)

Time: 3 hrs Maximum: 60 Marks

Answer ALL questions

(The figures in the right-hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

	Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a.	Define (i) Analytic function (ii) Harmonic function.	CO1	K1
b.	State Cauchy's integral formula.	CO2	K1
c.	Form the Newton's divided difference table for the following data:	CO3	K2

X	2	5	10
Y	5	29	109

d.	Write the formula for Simpson's $\frac{1}{3}$ rule.	CO4	K1
e.	What is the range of correlation coefficient?	CO5	K1

PART – B **(10 x 5 = 50 Marks)**

	Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a.	Verify that the function $u(x,y) = 3x^2y + 2x^2 - y^3 - 2y^2$ is harmonic, and find its harmonic conjugate $v(x,y)$.	5	CO1	K2
b.	Find the bilinear transformation which maps the points $z_1 = -1, z_2 = 0, z_3 = 1$ into the points $\omega_1 = 0, \omega_2 = i, \omega_3 = 3i$ respectively.	5	CO1	K1
	(OR)			
c.	Check whether the function $f(z) = \frac{1}{z}$ is analytic or not.	5	CO1	K2
d.	Determine the region in the ω-plane in which the rectangle bounded by the lines $x = 0, y = 0, x = 2$, and $y = 1$ is mapped under the transformation $\omega = z + 2 + 3i$.	5	CO1	K2
3.a.	Expand $\frac{1}{(z-1)(z-2)}$ in Laurent's series valid for $1 < \lvert z \rvert < 2$.	5	CO2	K2
b.	Evaluate $\int_C \frac{2z-1}{z(z+1)(z-3)} dz$ where C is the circle $\lvert z \rvert = 2$ using Cauchy residue theorem.	5	CO3	K2
	(OR)			
c.	Using Cauchy's integral formula, calculate $\int_C \frac{z^2+1}{z(2z+1)} dz$, where C is $\lvert z \rvert = 1$.	5	CO2	K2
d.	Evaluate $\int_0^{2\pi} \frac{d\theta}{5-4\sin\theta}$ over a circle $\lvert z \rvert = 1$.	5	CO3	K2
4.a.	Find the value of y at $x = 2.65$ for the data given below.	5	CO3	K1

x	-1	0	1	2	3
y	-21	6	15	12	3

b.	For the following data, find the cubic function of x using Newton's divided difference formula and hence find $f(2)$.	5	CO4	K1

x	0	1	2	5
$f(x)$	2	3	12	147

(OR)

c. Evaluate $\int_0^5 \frac{dx}{4x+5}$ using Simpson's $\frac{1}{3}$ rule with $n = 10$ and hence find the value of $\log_e 5$. 5 CO3 K1

d. Find $y'(x)$ given 5 CO4 K1

x	0	1	2	3	4
$f(x)$	1	1	15	40	85

5.a. Use Lagrange's interpolation formula to fit a polynomial to the following data 5 CO4 K1

x	0	1	3	4
y	-12	0	6	12

and hence find the value of y when $x = 2$.

b. Find a real root of $-4x + cosx + 2 = 0$ correct to four decimal places by Newton Raphson method assuming $x_0 = 0.5$. 5 CO3 K2

(OR)

c. Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal rule with $h = 2$. Hence, find the value of π. 5 CO3 K1

d. Using Taylor series method, find $y(0.1)$ given $\frac{dy}{dx} = x^2 - y,\ y(0) = 1$ correct to 4 decimal places. 5 CO5 K1

6.a. Out of the two lines of regression, which is the regression line of X on Y? 5 CO6 K2

$$X + 2y = 5, 2X + 3Y = 8.$$

Also, compute (i) the mean values of X and Y and (ii) the correlation coefficient.

b. Apply Runge-Kutta method to find $y(0.1)$ given $\frac{dy}{dx} = -2x - y,\ y(0) = -1$ with $h = 0.1$. 5 CO5 K1

(OR)

c. Find the regression equations for the following data. 5 CO6 K2

X	10	14	18	22	26	30
Y	18	12	24	6	30	36

d. Using modified Euler's method, find $y(0.2)$ and $y(0.4)$ given $y' = x^2 + y^2, y(0) = 1$ by taking $h = 0.2$. 5 CO5 K1

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