5. (a) Fit a straight line to the following data by least square method : (CO5)

x	y
0	12
5	15
10	17
15	22
20	24
25	30

(b) Find the coefficient of correlation and regression lines of the following data :

(CO5)

x	y
5	33
7	30
8	28
10	20
11	18
13	16
16	9

(c) Solve the equation $x^3 - 27x + 54 = 0$, by Cardan's method. (CO5)

H   Roll No. ....

TMA–302

B. TECH. (CE) (THIRD SEMESTER) END SEMESTER EXAMINATION, Jan., 2023

ENGINEERING MATHEMATICS–II

Time : Three Hours

Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any *two* sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are **twenty**.

(iv) Each sub-question carries 10 marks.

1. (a) Find the Fourier transformation of the function : (CO1)

$$f(x) = \begin{cases} 1 + \dfrac{x}{a}, & \text{for} -a < x < 0 \\ 1 - \dfrac{x}{a}, & \text{for } 0 < x < a \\ 0, & \text{otherwise} \end{cases}$$

P. T. O.

(b) Find the Fourier cosine transform of

$$\frac{1}{1+x^2}.$$ (CO1)

(c) Using Fourier integral show that : (CO1)

$$\int_0^\infty \frac{\cos \lambda x}{1+\lambda^2} d\lambda = \frac{\pi}{2} e^{-x}, x > 0$$

2. (a) Show that the function

$$u = \frac{1}{2} \log\left(x^2 + y^2\right)$$ is harmonic. Also

find its harmonic conjugate. (CO2)

(b) Define the following with example :(CO2)

(i) Conformal mapping

(ii) Bilinear transformation

(iii) Fixed point

(iv) Analytic function

(c) Determine the analytic function $f(z) = u + iv$ in terms of z, whose real part is $u(x, y) = 3x^2 y + 2x^2 - 2y^2 - y^3$.

(CO2)

3. (a) Find the smallest positive root of $x^3 - 5x + 3 = 0$ by using Newton's Raphson method. (CO3)

(b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's one-third rule dividing the range into 6 equal parts. (CO3)

(c) Find a real root of the equation $x^3 - 5x - 7 = 0$ correct to three decimal places using false position method. (CO3)

4. (a) A die is thrown 8 times and it is required to find the probability that 4 will show (i) Exactly 2 times (ii) At least six times (iii) At most 2 time. (CO4)

(b) Define the following : (CO4)

(i) Poisson distribution

(ii) Conditional probability

(iii) Properties of Normal distribution

(c) In a bolt factory, machines A, B and C manufacture respectively 25%, 35% and 40% of the total. If their output 5, 4 and 2 percent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability that it was manufactured by machine A, B and C. (CO4)