

B. TECH. II (ODD SEMESTER)**THEORY EXAMINATION (2017-18)****ENGINEERING MATHEMATICS III**

Max. Marks = 50

Time = 3 Hours

Note: Attempt all questions. $(4 \times 2.5 = 10)$

1. Attempt any four parts:

- a) If $f(z)$ is analytic function of z then show that x and y can occur in $f(z)$ in the combination of $x + iy$.
- b) Find five terms in Laurent's expansion of $\frac{1}{z(e^z - 1)}$ for the region $0 < |z| < 2\pi$ and

evaluate $\int_0^{2\pi} \frac{d\theta}{a+b\sin\theta}$, $a > |b|$.

- c) Find the residue of $\frac{1+e^z}{\sin z + z\cos z}$ and evaluate the integral $\int_C \frac{(12z-7)dz}{(z+1)^2(2z-3)}$, where C is $|z-i| = \sqrt{3}$.

- d) Integrate the integral: $\int_0^\infty \frac{x^n dx}{x+x^2}$, $0 \leq n \leq 1$, by contour integration.

- e) Fit a second degree parabola to the data given below:

x	0	1	2	3	4
y	1	1.8	1.4	2.5	6.4

- f) Using the following table, find the equations of regression lines:

x	6	2	10	4	8
y	9	11	5	8	7

2. Attempt any two parts:

 $(2 \times 5 = 10)$

- a) Use Newton-Raphson method to find a root of $x^3 - 3x + 1 = 0$ which lies between 1 and 2, and evaluate cube root of 30.

- b) Solve $x^3 - 2x - 5 = 0$ to find a root between 2 and 3 by Regula-Falsi method.

- c) Find interpolation polynomial for following table by using Newton Divided difference formula:

x	3	7	9	10
y	168	120	72	63

3. Attempt any two parts:

 $(2 \times 5 = 10)$

- a) Find cubic polynomial using Lagrange's method for table given below:

x	-1	0	2	23
y	-8	3	1	112

b) Evaluate $f(3.8)$ and $f(0.5)$ from following table:

x	0	1	2	3	4
$f(x)$	1	1.5	2.2	3.1	4.6

c) Solve $x^3 - 3x - 5 = 0$ to find a root between 2 and 3 using Bisection method.

4. Attempt any two parts: $(2 \times 5 = 10)$

a) Solve the following equations by Gauss-Siedel method:

$$5x + 2y + z = 12;$$

$$x + 2y + 5z = 20;$$

$$x + 4y + 2z = 15.$$

b) Solve the following equations by Crout's method:

$$x + 2y + 3z = 10;$$

$$2x + 5y + 2z = 18;$$

$$3x + 2y + 6z = 19.$$

c) Solve the differential equation: $\frac{dy}{dx} = 2x + y^2$, $y(0) = 1$ to find $y(1)$ using Picard's method.

5. Attempt any two parts: $(2 \times 5 = 10)$

a) Apply Runge-Kutta method of order four to solve $\frac{dy}{dx} = 2x + y$; $y(0) = 1$ to find $y(1)$.

b) Evaluate $\int_0^{1.2} \frac{e^{-x} dx}{1+x^2}$ by Simpson's three-eighth rule by taking $h = 0.1$. Also, evaluate

$\int_0^1 \frac{dx}{1+x^2}$ by Simpson's one third rule.

c) Solve: $\frac{dy}{dx} = 2x + 3y$; $y(0) = 1$ to find $y(0.5)$ using Euler's method.



B.TECH. II (ODD SEMESTER)

Minor Test

Engineering Mathematics III

BAS - 21

Time: 2 Hrs.

Max. Marks: 30

Note: Attempt all questions. Part (a) of each question is compulsory. Attempt any two parts out of remaining three parts in each question.

1. (a) If $u = x^2 - y^2 + 5x + y - \frac{y}{x^2+y^2} + 6$, then find analytic function $f(z)$ in terms of z . (4)

(b) Evaluate $\int_C \frac{z+\cos\pi z^2}{(z-2)(z-3)} dz$, where C is $|z| = 4$. (3)

(c) Calculate Karl Pearson Coefficient of Skewness from following table: (3)

C.I.	55-58	58-61	61-64	64-67	67-70
f	12	17	23	18	11

(d) Find the Kurtosis of the following frequency distribution: (3)

C.I.	0-10	10-20	20-30	30-40
f	1	3	4	2

2. (a) Expand, in Laurent series, the function $\frac{4z+3}{z(z-3)(z+2)}$ for $2 < |z| < 5$. (4)

(b) Evaluate: $\int_C \frac{2z^2+z}{(z-1)(z+1)} dz$, where C is $|z+1| = 1$. (3)

(c) Evaluate: $\int_0^{2\pi} \frac{d\theta}{(5+4\cos\theta)^2}$. (3)

(d) Evaluate: $\int_0^\infty \frac{x^2}{1+x^4} dx$. (3)

92^{2x3}

3. (a) Calculate Bowley's Coefficient of Skewness from table given below:

C.I.	0-10	10-20	20-30	30-40	40-50	50-60	60-70
f	2	5	10	15	10	4	2

(b) Find the equation of straight line of best fit to the following data:

x	50	70	100	120
y	12	15	21	25

(c) Calculate correlation coefficient from the table given below:

x	3	4	6	8	10	12
y	1	2	3	4	6	10

(d) Find the regression lines from following table:

x	6	2	10	4	8
y	9	11	5	8	7

α ✓

B.Tech. IInd Year
Minor Examination-2019
Subject Name: Engineering Mathematics-III

Time: 2 hrs.**Max. Marks: 30****Note: Attempt all questions.**

Q.1 Attempt any three of the following. Q. 1(a) is compulsory.

- (a) If $f(z) = u + iv$ is an analytic function of $z = x + iy$ and $u + v = (x + y)(2 - 4xy + x^2 + y^2)$, then find u, v and the analytic function $f(z)$. (4)
- (b) Evaluate the integral $\oint_C \frac{(z-2)dz}{(z-1)^3(z+2)^3}$; where C is $|z| = 3$, by using Cauchy integral formula. (3)
- (c) Using the method of least squares, fit the curve $y = \frac{a}{x} + bx$ for the following data (3)

x	1	2	4	6	8
y	5.43	6.28	10.32	14.86	19.50

- (d) Obtain Mean and Variance of Poisson distribution. (3)

Q.2 Attempt any three of the following. Q. 2(a) is compulsory.

- (a) Find all possible Taylor's and Laurent's series expansion of the function $f(z) = \frac{1}{(z+1)(z+2)^2}$ about the point $z = 1$. (4)
- (b) Evaluate $\int_0^\pi \frac{\cos \theta d\theta}{1-2a \cos \theta+a^2}$, Where $|a| < 1$, by method of residue. (3)
- (c) Evaluate $\int_{-\infty}^{\infty} \frac{\cos ax dx}{b^2+x^2}$, $a > 0, b > 0$, by method of residue. (3)
- (d) Apply residue theorem to evaluate $\oint_C \frac{z^3 dz}{z^4-1}$; where C is $|z| = 2$. (3)

Q. 3 Attempt any three of the following. Q. 3(a) is compulsory.

- (a) Calculate correlation coefficient between x and y from the following results: (4)
 $N = 10, \sum x = 140, \sum y = 150, \sum(x - 10)^2 = 180, \sum(y - 15)^2 = 215, \sum(x - 10)(y - 15) = 60$.
- (b) Find out the regression coefficients of regression line Y on X and X on Y from the following data: (3)
 $\sum X = 50, \sum Y = 60, \sum XY = 350, \text{Mean of } X = 5, \text{Mean of } Y = 6, \text{Variance of } X = 4 \text{ and Variance of } Y = 9$.
- (c) The first four central moments of a distribution are $\mu_1 = 0, \mu_2 = 16, \mu_3 = -36, \mu_4 = 120$. Obtain the first four moments about the origin, i.e., zero and Comment on the skewness and kurtosis of the distribution. mean = 5 (3)
- (d) The probability of a man hitting a target is $\frac{1}{4}$ (3)
 - i. If he fires 7 times what is the probability of his hitting the target at least twice?
 - ii. How many times must he fire so that the probability of his hitting the target at least once is greater than $\frac{2}{3}$.

B.Tech. IInd Year
Minor Examination-2019
Subject Name: Engineering Mathematics-III

Time: 2 hrs.**Max. Marks: 30****Note: Attempt all questions.**

Q.1 Attempt any three of the following. Q. 1(a) is compulsory.

(a) If $f(z) = u + iv$ is an analytic function of $z = x + iy$ and $u + v = (x + y)(2 - 4xy + x^2 + y^2)$, then find u, v and the analytic function $f(z)$. (4)(b) Evaluate the integral $\oint_C \frac{(z-2)dz}{(z-1)^3(z+2)^3}$; where C is $|z| = 3$, by using Cauchy integral formula. (3)(c) Using the method of least squares, fit the curve $y = \frac{a}{x} + bx$ for the following data (3)

x	1	2	4	6	8
y	5.43	6.28	10.32	14.86	19.50

(d) Obtain Mean and Variance of Poisson distribution. (3)

Q.2 Attempt any three of the following. Q. 2(a) is compulsory.

(a) Find all possible Taylor's and Laurent's series expansion of the function $f(z) = \frac{1}{(z+1)(z+2)^2}$ about the point $z = 1$. (4)(b) Evaluate $\int_0^\pi \frac{\cos \theta d\theta}{1-2a \cos \theta + a^2}$, Where $|a| < 1$, by method of residue. (3)(c) Evaluate $\int_{-\infty}^{\infty} \frac{\cos ax dx}{b^2+x^2}$, $a > 0, b > 0$. by method of residue. (3)(d) Apply residue theorem to evaluate $\oint_C \frac{z^3 dz}{z^4-1}$; where C is $|z| = 2$. (3)

Q. 3 Attempt any three of the following. Q. 3(a) is compulsory.

(a) Calculate correlation coefficient between x and y from the following results: (4)

$$N = 10, \sum x = 140, \sum y = 150, \sum(x - 10)^2 = 180, \sum(y - 15)^2 = 215, \sum(x - 10)(y - 15) = 60.$$

(b) Find out the regression coefficients of regression line Y on X and X on Y from the following data: (3)

$$\sum X = 50, \sum Y = 60, \sum XY = 350, \text{Mean of } X = 5, \text{Mean of } Y = 6, \\ \text{Variance of } X = 4 \text{ and Variance of } Y = 9.$$

(c) The first four central moments of a distribution are $\mu_1 = 0, \mu_2 = 16, \mu_3 = -36, \mu_4 = 120$. Obtain the first four moments about the origin, i.e., zero and Comment on the skewness and kurtosis of the distribution. $\bar{x} = 5$ (Mean) (3)(d) The probability of a man hitting a target is $\frac{1}{4}$ (3)

- i. If he fires 7 times what is the probability of his hitting the target at least twice?
- ii. How many times must he fires so that the probability of his hitting the target at least once is greater than $\frac{2}{3}$.

B.Tech. IInd Year
Minor Examination-2018
Subject Name: Engineering Mathematics-III

Max. Marks: 30**Time: 2 hrs.****Note: Attempt all questions.****Q.1** Attempt any three of the following. Q. 1(a) is compulsory.

- (a) Show that the function $v(x, y) = y + 3x^2y - y^3$ is harmonic. Find the corresponding conjugate harmonic function $u(x, y)$ and construct the analytic function in term of z . (4)
- (b) Evaluate the integral $\oint_C \frac{e^z dz}{z^2(z+1)^3}$; where C is $|z| = 2$, by using Cauchy integral formula. (3)
- (c) In two set of variables X and Y with 50 observations each, the following data were observed: $\bar{X} = 10$, $\bar{Y} = 6$, $\sigma_X = 3$, $\sigma_Y = 2$ and $r(X, Y) = 0.3$. But on subsequent verification it was found that one value of $X (=10)$ and the corresponding value of $Y (=6)$ were in-accurate and hence weeded out. With the remaining 49 pair of values, how is the original value of $r(X, Y)$ affected? (3)
- (d) Obtain Mean and variance of Binomial distribution. (3)

Q.2 Attempt any three of the following. Q. 2(a) is compulsory.

- (a) Evaluate $\int_0^{2\pi} \frac{d\theta}{1-2a \cos \theta + a^2}$, Where a is a complex constant and (i) $|a| < 1$, (ii) $|a| > 1$ by method of residue. (4)
- (b) Apply residue theorem to evaluate $\oint_C \frac{e^z(z^2+4)dz}{(z-i)^3}$; where C is $|z| = 2$. (3)
- (c) Evaluate $\int_{-\infty}^{\infty} \frac{\sin^2 2x dx}{1+x^2}$ by method of residue. (3)
- (d) Find the Laurent series expansion of $f(z) = \frac{1}{(2z^2-iz)}$ about $z = 0$ which converges at $z = i$. (3)

Q. 3 Attempt any three of the following. Q. 3(a) is compulsory.

- (a) Using the method of least squares, fit the curve $y = ax + \frac{b}{\sqrt{x}}$ for the following data (4)

x	0.2	0.3	0.5	1	2
y	16	14	11	6	3

- (b) Twenty five pairs of value of variates X and Y led to the following results: $N = 25$, $\sum X = 127$, $\sum Y = 100$, $\sum X^2 = 760$, $\sum Y^2 = 449$ and $\sum XY = 500$. A subsequent scrutiny showed that two pairs of values were copied down as (3)

X	Y
8	14
8	6

Instead of

X	Y
8	12
6	8

I. Obtain the correct value of the correlation coefficient.

II. Hence or otherwise, find the correct equations of two lines of regression.

III. Find the angle between the regression lines.

- (c) For a distribution, the mean is 10, variance is 16, γ_1 is +1 and β_2 is 4. Obtain the first four moments about the origin, i.e., zero and Comment on the skewness and kurtosis of the distribution. (3)

- (d) In a binomial distribution consisting of 5 independent trials, probabilities of 1 and 2 successes are 0.4096 and 0.2048 respectively. Find the parameter p of the distribution. (3)

B. TECH. II (ODD SEMESTER)

THEORY EXAMINATION (2017-18)

ENGINEERING MATHEMATICS III

Time = 3 Hours

Max. Marks = 50

Note: Attempt all questions.

1. Attempt any four parts:

(4 × 2.5 = 10)

- a) If $f(z)$ is analytic function of z then show that x and y can occur in $f(z)$ in the combination of $x + iy$.
- b) Find five terms in Laurent's expansion of $\frac{1}{z(e^z - 1)}$ for the region $0 < |z| < 2\pi$ and evaluate $\int_0^{2\pi} \frac{d\theta}{a+b\sin\theta}$, $a > |b|$.
- c) Find the residue of $\frac{1+e^z}{\sin z + z \cos z}$ and evaluate the integral $\int_C \frac{(12z-7)dz}{(z+1)^2(2z-3)}$, where C is $|z-i| = \sqrt{3}$.
- d) Integrate the integral: $\int_0^\infty \frac{x^n dx}{x+x^2}$, $0 \leq n \leq 1$, by contour integration.
- e) Fit a second degree parabola to the data given below:

x	0	1	2	3	4
y	1	1.8	1.4	2.5	6.4

- f) Using the following table, find the equations of regression lines:

x	6	2	10	4	8
y	9	11	5	8	7

2. Attempt any two parts:

(2 × 5 = 10)

- a) Use Newton-Raphson method to find a root of $x^3 - 3x + 1 = 0$ which lies between 1 and 2, and evaluate cube root of 30.
- b) Solve $x^3 - 2x - 5 = 0$ to find a root between 2 and 3 by Regula-Falsi method.
- c) Find interpolation polynomial for following table by using Newton Divided difference formula:

x	3	7	9	10
y	168	120	72	63

3. Attempt any two parts:

(2 × 5 = 10)

- a) Find cubic polynomial using Lagrange's method for table given below:

x	-1	0	2	23
y	-8	3	1	112

b) Evaluate $f(3.8)$ and $f(0.5)$ from following table:

x	0	1	2	3	4
$f(x)$	1	1.5	2.2	3.1	4.6

c) Solve $x^3 - 3x - 5 = 0$ to find a root between 2 and 3 using Bisection method.

4. Attempt any two parts:

($2 \times 5 = 10$)

a) Solve the following equations by Gauss-Siedel method:

$$5x + 2y + z = 12;$$

$$x + 2y + 5z = 20;$$

$$x + 4y + 2z = 15.$$

b) Solve the following equations by Crout's method:

$$x + 2y + 3z = 10;$$

$$2x + 5y + 2z = 18;$$

$$3x + 2y + 6z = 19.$$

c) Solve the differential equation: $\frac{dy}{dx} = 2x + y^2$, $y(0) = 1$ to find $y(1)$ using Picard's method.

5. Attempt any two parts:

($2 \times 5 = 10$)

a) Apply Runge-Kutta method of order four to solve $\frac{dy}{dx} = 2x + y$; $y(0) = 1$ to find $y(1)$.

b) Evaluate $\int_0^{1.2} \frac{e^{-x} dx}{1+x^2}$ by Simpson's three-eighth rule by taking $h = 0.1$. Also evaluate

$\int_0^1 \frac{dx}{1+x^2}$ by Simpson's one third rule.

c) Solve: $\frac{dy}{dx} = 2x + 3y$; $y(0) = 1$ to find $y(0.5)$ using Euler's method.

B. Tech

Year 2nd Semester: III

Major Examination-2016-2017

Subject Name: Engineering Mathematics III

Time: 3 hrs.

Max. Marks: 40

Note: Attempt all questions. Each question carries equal marks.

Q. 1 Attempt any three parts of the following. Q. 1 (a) is compulsory.

(a) If $f(z)$ is analytic function of z , then show that
 x and y can occur in $f(z)$ only in combination $(x + iy)$.

(4)

(b) If $u = x^3 + 3x^2 - 3y^2 - 3xy^2 + 5$, then find $w = f(z)$ in terms of z and also evaluate $\int_{|z|=3} \frac{z^2 dz}{(z-1)^2(z+2)}$.

(3)

(c) Expand in Laurent Series the function $\frac{z^2-6z+1}{(z-1)(z+2)(z-3)}$ in the region $3 < |z+2| < 5$, andalso using Residue theorem, evaluate $\int_C \frac{11z-5}{(z+1)^2(2z+3)} dz$ where C is $|z+i| = \sqrt{3}$.

(3)

(d) Evaluate the integral $\int_{-\infty}^{\infty} \frac{x^2 dx}{1+x^2}$.

(3)

Q. 2 Attempt any three parts of the following. Q. 2 (a) is compulsory..

(a) Fit a second degree parabola to the following data:

x	1	2	3	4	5	6	7	8	9
y	2	6	7	8	10	11	12	10	9

(4)

(b) Calculate correlation coefficient from following table:

x	3	4	6	8	10	12
y	1	2	3	4	6	10

If two regression lines are $20x - 9y = 107$ and $4x - 5y = -33$ and variance of x is 9,
then calculate r and σ_y .

(3)

(c) Explain the different types of skewness and kurtosis.

Calculate Kelly's coefficient of skewness from following table:

Marks obt.	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of students	3	8	9	14	16	18	8	4

(3)

(d) If there is 60% chance of power cut in a city on any particular day, then find the probability
that from first to 10th date of the month there are 6 or more days without power cut.

If the income of a group of 10000 persons was found to be randomly distributed with mean Rs.750 and standard deviation Rs.50. What percent of the group had income exceeding Rs.668 and how many had income exceeding Rs.832? Given area for $z=1.64$ is 0.4495.

(3)

Q. 3 Attempt any three parts of the following. Q. 3 (a) is compulsory.

(a) Apply Newton-Raphson method to find a root between 1 and 2 of the equation

$$x^4 - x - 13 = 0 \text{ and find value of } \sqrt{53}.$$

(4)

(b) Using Newton's forward and backward interpolation formulae find the values of $f(2.5)$ and $f(5.5)$ from following table:

x	2	3	4	5	6
$f(x)$	1	8	27	64	125

(3)

(c) State and prove Newton's divided difference formula. Use it to find polynomial $f(x)$ from table given below:

x	3	7	9	10
$f(x)$	168	120	72	63

(3)

(d) Use Lagrange's formula to find a cubic polynomial from following table:

x	0	2	3	6
$f(x)$	659	705	729	804

and hence find $f(5)$.

(3)

Q. 4 Attempt any three parts of the following. Q. 4 (a) is compulsory.

(a) Solve by Crout's method, the following system:

$$x + 2y + 3z = 14;$$

$$2x + 5y + 2z = 18;$$

$$3x + 2y + 5z = 22.$$

(4)

(b) Solve, by Picard's method, the differential equation $\frac{dy}{dx} = x + y; y(0) = 1$ to find $y(2)$.

(3)

(c) Solve $\frac{dy}{dx} = xy + y; y(0) = 1$ to find $y(0.2)$ in two steps by using Runge - Kutta method of order 4.

(3)

(d) Evaluate $\int_0^3 \frac{dx}{1+x+x^2}$ by Simpson's one - third as well as by Simpson's three - eight rules.

(3)

B.Tech.

ODD SEMESTER

MAJOR EXAMINATION 2019-2020

Subject Name: Engineering Mathematics-III

Time: 3 hrs.

Max. Marks: 50

Note: Attempt all questions. Each question carry equal marks.

Q.1 Attempt any five parts of the following.

5x2=10

- (a) Find the constants a, b, c such that the function $f(z) = x - 2ay + i(bx - cy)$ is analytic. Express $f(z)$ in term of z .
- (b) If the function $w = f(z) = u(r, \theta) + iv(r, \theta)$ is analytic, then show that $\frac{dw}{dz} = e^{-i\theta} \frac{\partial w}{\partial r}$.
- (c) Evaluate the integral $\oint_C \frac{dz}{z(2z-1)}$, where C is $|z| = 1$, by using Cauchy integral formula.
- (d) An irregular six faced dice is thrown 12 times. The expectation that it will give six even numbers is twice the expectation that it will give 5 even numbers. If 1000 sets, each of exactly 12 trials are made, how many sets are expected not to give any even number?
- (e) Derive angle between the two lines of regression and interpret the cases when correlation coefficient, $r = 0$ and $r = \pm 1$.
- (f) By the method of least squares find the best fitting straight line to the data given below:

x	5	10	15	20	25
y	16	19	23	26	30

- (g) In a Poisson frequency distribution, frequency corresponding to 3 successes is $2/3$ times frequency corresponding to 4 successes. Find the mean and standard deviation of the distribution.

2x5=10

Q.2 Attempt any two parts of the following.

- (a) Find an interval of unit length which contains the smallest positive root of equation $x^3 + x^2 - 1 = 0$. Hence, determine the number of iteration required by the bisection method so that $|\text{error}| < 10^{-4}$. Also find the approximate root with $|\text{error}| < 10^{-4}$.

- (b) Find the iterative scheme based on the Newton-Raphson method for finding $N^{\frac{1}{3}}$ where N is a positive real number. Apply the scheme to $N=18$ to obtain the results correct to four decimal places.

From the data given below, find the number of students whose weight is between 110 and 120 by suitable interpolation formula.

Weight	0-40	40-60	60-80	80-100	100-120
No of Students	250	120	100	70	50

2x5=10

Q.3 Attempt any two parts of the following.

- (a) From the following table, obtain $f(x)$ as a polynomial in powers of $(x-5)$.

x	0	2	3	4	5	6
f(x)	4	26	58	112	466	922

- (b) Using Lagrange's formula, fit a polynomial to the following data and also find y at $x = 2$.

x	0	1	3	4
y	-12	0	6	12

- (c) Prove that n th divided differences of a polynomial of degree n are constant and construct the divided difference table for the following data:

x	-2	0	3	5	7	8
y	-792	108	-72	48	-144	-252

Q.4 Attempt any two parts of the following.

2x5=10

- (a) The velocity v of a particle moving in a straight line covers a distance x in time t . They are related as follows :

x	0	10	20	30	40
v	45	60	65	54	42

Find time taken to traverse the distance of 40 units using Trapezoidal and Simpson's 1/3 rule.

- (b) Using Euler's method, solve numerically $\frac{dy}{dx} = x + y, y(0) = 1$, for $x = 0.0(0.2)(1.0)$. Compare the results with the exact solution.

- (c) Solve $\frac{dy}{dx} + y = e^x, y(0) = 0$, by Picard's method upto the fifth approximation.

Q.5 Attempt any two parts of the following.

2x5=10

- (a) Evaluate the integral $I = \int_4^{5.2} \log_e x \, dx$ using Trapezoidal, Simpson's 1/3 and Simpson's 3/8 rule and verify your results by actual integration.

- (b) Solve, by Crout's method, the following system of linear equation:

$$x + y + z = 3; 2x - y + 3z = 16; 3x + y - z = -3.$$

- (c) Solve, by Gauss Seidel method, the following system of linear equation:

$$x + y + 54z = 110; 27x + 6y - z = 85; 6x + 15y + 2z = 72.$$

B.Tech.
 ODD SEMESTER
 MAJOR EXAMINATION 2019-2020
 Subject Name: Engineering Mathematics-III

Time: 3 hrs.

Max. Marks: 50

Note: Attempt all questions. Each question carry equal marks.

Q.1 Attempt any five parts of the following.

5x2=10

- Find the constants a, b, c such that the function $f(z) = x - 2ay + i(bx - cy)$ is analytic. Express $f(z)$ in term of z .
- If the function $w = f(z) = u(r, \theta) + iv(r, \theta)$ is analytic, then show that $\frac{dw}{dz} = e^{-i\theta} \frac{\partial w}{\partial r}$.
- Evaluate the integral $\oint_C \frac{dz}{z(2z-1)}$; where C is $|z| = 1$, by using Cauchy integral formula.
- An irregular six faced dice is thrown 12 times. The expectation that it will give six even numbers is twice the expectation that it will give 5 even numbers. If 1000 sets, each of exactly 12 trials are made, how many sets are expected not to give any even number?
- Derive angle between the two lines of regression and interpret the cases when correlation coefficient, $r = 0$ and $r = \pm 1$.
- By the method of least squares find the best fitting straight line to the data given below:

x	5	10	15	20	25
y	16	19	23	26	30

- In a Poisson frequency distribution, frequency corresponding to 3 successes is $2/3$ times frequency corresponding to 4 successes. Find the mean and standard deviation of the distribution.

Q.2 Attempt any two parts of the following.

2x5=10

- Find an interval of unit length which contains the smallest positive root of equation $x^3 + x^2 - 1 = 0$. Hence, determine the number of iteration required by the bisection method so that $|\text{error}| < 10^{-4}$. Also find the approximate root with $|\text{error}| < 10^{-4}$.
- Find the iterative scheme based on the Newton-Raphson method for finding $N^{\frac{1}{3}}$ where N is a positive real number. Apply the scheme to $N=18$ to obtain the results correct to four decimal places.
- From the data given below, find the number of students whose weight is between 110 and 120 by suitable interpolation formula.

Weight	0-40	40-60	60-80	80-100	100-120
No of Students	250	20	100	70	50

Q.3 Attempt any two parts of the following.

2x5=10

- From the following table, obtain $f(x)$ as a polynomial in powers of $(x-5)$.

x	0	2	3	4	5	6
f(x)	4	26	58	112	466	922

- Using Lagrange's formula, fit a polynomial to the following data and also find y at $x = 2$.

Q.3 Attempt any two parts of the following.

2x5=10

- Prove that n th divided differences of a polynomial of degree n are constant and construct the divided difference table for the following data:

x	-2	0	3	5	7	8
y	-792	108	-72	48	-144	-252

Q.4 Attempt any two parts of the following.

2x5=10

- The velocity v of a particle moving in a straight line covers a distance x in time t . They are related as follows :

x	0	10	20	30	40
v	45	60	65	54	42

Find time taken to traverse the distance of 40 units using Trapezoidal and Simpson's 1/3 rule.

- Using Euler's method, solve numerically $\frac{dy}{dx} = x + y, y(0) = 1$, for $x = 0.0(0.2)(1.0)$. Compare the results with the exact solution.
- Solve $\frac{dy}{dx} + y = e^x, y(0) = 0$, by Picard's method upto the fifth approximation.

Q.5 Attempt any two parts of the following.

2x5=10

- Evaluate the integral $I = \int_4^{5.2} \log_e x \, dx$ using Trapezoidal, Simpson's 1/3 and Simpson's 3/8 rule and verify your results by actual integration.

- Solve, by Crout's method, the following system of linear equation:

$$x + y + z = 3; 2x - y + 3z = 16; 3x + y - z = -3.$$

- Solve, by Gauss Seidel method, the following system of linear equation:

$$x + y + 54z = 110; 27x + 6y - z = 85; 6x + 15y + 2z = 72.$$