SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Mathematics
B. Tech. (Mechanical) Semester III Minor I Examination (Odd) 2018-19

Entry No: 17bme021 Total Number of Pages: [01]
Date: 01/09/2018 Total Number of Questions: [05]
Course Title: ENGINEERING COMPUTATIONAL METHODS
Course Code: MTL 2025

Time Allowed: 1.5 Hours **Max Marks: [20]**

Instructions / NOTE

i. Attempt All Questions.
ii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.
iii. Use of IS Code (Scientific calculator) is permissible in examination.

Q1. (a) Explain the working procedure to fit the parabola by the method of least squares. [02] CO1

(b) Geometrically explain the Newton-Raphson method. [02] CO1

Q2. Estimate y at $x = 2.25$ *and* 3.04 by fitting the indifference curve of the form $xy = Ax + B$ to the following data:

x	1	2	3	4
y	3	1.5	6	7.5

[04] CO2

Q3. a) Find a real root of $2x - log_{10}x = 7$ correct to four decimal places using iteration method. [02] CO2

b) Find the secant method formula for finding the square root of a positive real number R. [02] CO2

Q4. By using the Bisection method, find an approximate root of the equation $sinx = {}^{1}/_{x}$, that lies between $x = 1$ *and* $x = 1.5$ (measured in radians). Carry out computations upto the 7^{th} stage. [04] CO2

Q5. Solve the equations $5x + 2y + z = 12,;\ x + 4y + 2z = 15;$ $x + 2y + 5z = 20$ by a) Jacobi's and b) Gauss-Seidal methods [04] CO2

Course Outcomes

CO1. Introduce the basic concept of Computational methods and their uses in engineering.
CO2. Enable the students to understand the concept of errors and their analysis in Numerical calculations.
CO3. Understand the methods of interpolation and extrapolation and their applications in engineering.
CO4. Understand the Numerical Differentiation and Numerical Integration and their uses in Engineering.
CO5. Understand the Numerical solution of ordinary differential equations which are useful to all branches of engineering.

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Mathematics
B. Tech. Minor II Examination (Odd) 2018-19

Entry No: 17bme021 Total Number of Pages: [01]
Date: 15/10/2018 Total Number of Questions: [05]
Course Title: ENGINEERING COMPUTATIONAL METHODS
Course Code: MTL 2025

Time Allowed: 1.5 Hours **Max Marks: [20]**

Instructions / NOTE
vii. Attempt All Questions.
viii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.
ix. Use of IS Code (Scientific calculator) is permissible in examination.

Q1. (a) What do you mean by finite differences. [01] CO3

(b) Define Shift operator and averaging operator. [02] CO3

(c) Define Interpolation and Extrapolation. [01]

Q2. a) Suppose that $f(x)$ be an interpolating polynomial satisfying the following data. Find the $f(x)$ and its value for $x = 2.5$ *and* 5.

x	0	1	2	3	4
y	2	3	12	35	78

[2.5] CO3

b) Find the lowest degree interpolating polynomial $\varphi(x)$ satisfying the following data points:

x	0	1	2	3	4	5
y	-7	-9	-11	-7	9	43

[2.5] CO3

Q3. Prove with usual notations i) $\Delta = \frac{1}{2}\delta^2 + \delta\sqrt{\left(1 + {\delta^2}/{4}\right)}$, ii) $\Delta^3 y_2 = \nabla^3 y_5$, iii) $\delta^2(1+\Delta) = \Delta^2$, iv) $\delta\left(y_{\frac{n+1}{2}} + y_{\frac{n-1}{2}}\right) = 2\delta\mu y_n$ [04] CO3

Q4. Using the following data find the value of φ at $t = 0.65$ using appropriate formula

t	0.2	0.3	0.4	0.5	0.6	0.7
$\varphi(t)$	0.1987	0.2255	0.3894	0.4794	0.5646	0.6442

[03] CO3

Q5. i) Derive the Newton's Divided Difference formula. [01] CO2

ii) Using Newton's divided difference formula, evaluate $f(8)$ and $f(15)$ given that

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

[03] CO3

Course Outcomes

CO1. Introduce the basic concept of Computational methods and their uses in engineering.
CO2. Enable the students to understand the concept of errors and their analysis in Numerical calculations.
CO3. Understand the methods of interpolation and extrapolation and their applications in engineering.
CO4. Understand the Numerical Differentiation and Numerical Integration and their uses in Engineering.
CO5. Understand the Numerical solution of ordinary differential equations which are useful to all branches of engineering.

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Mathematics
B. Tech. MAJOR Examination (Odd) 2018-19

Entry No: | | | | | | | | | | |

Total Number of Pages: [01]

Date: 02/12/2018

Total Number of Questions: [05]

Course Title: ENGINEERING COMPUTATIONAL METHODS
Course Code: MTL 2025

Time Allowed: 1.5 Hours **Max Marks: [50]**

Instructions / NOTE

i. Attempt All Questions.
ii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.
iii. Use of IS Code (Scientific calculator) is permissible in examination.

Section - A

Q1. Define the following terms:

(a) Write down the normal equations to fit a quadratic equation by least square method. [01] CO3

(b) When should we use Newton's backward interpolation formula? [01] CO3

(c) Write the distributive, commutative and Index laws of operator Δ. [02] CO2

(d) Write the relation between E *and* Δ. [02] CO2

(e) What is principle of least squares? [02] CO3

(f) What do you mean by Finite differences? [02] CO2

Section - B

Q2. (a) A rocket is launched from the ground. Its acceleration is registered during the first 80 seconds and is given in the table below. Using Simpson's 1/3 rule and Simpson's 3/8 rule, find the velocity and height of the rocket at t=80. [05] CO4

t(s)	0	10	20	30	40	50	60	70	80
a(m/s^2)	30	31.63	33.64	35.47	37.75	40.33	43.25	46.69	50.67

b) Derive General Quadrature formula for equidistant ordinates. [02] CO4

Q3. (a) Solve $\frac{dy}{dx} = 1 - y, y(0) = 0$ in the range $0 \leq x \leq 0.3$ using i) Euler's method and ii) modified Euler's method by choosing $h = 0.1$. Compare the answers with the exact solution. [06] CO4

b) Solve by Gauss-Seidel method, the following system of equations:
$28x - 4y - z = 32; x + 3y + 10z = 24; 2x + 17y + 4z = 35$ [06] CO4

X	-1	1	2	3
y	-21	15	12	3

[02] CO3

b) Compute the missing terms in the following table:

x	2	3	4	5	6	7	8
$f(x)$	0.135	-	0.111	0.100	-	0.082	0.074

[05] CO2

Q6. a) Explain the Iteration method. [02] CO1

b) Using Newton-Raphson method, find a root correct to three decimal places of the equation $xe^x - cosx = 0$. [05] CO2

Q7. a) Find $f(x)$ as a polynomial in x for the following data by Newton's divided difference formula [03] CO3

x	-4	-1	0	2	5
$f(x)$	1245	33	5	9	1335

b) While testing a centrifugal pump, the following data is obtained.

x	2	2.5	3	3.5	4	4.5	5	5.5	6
y	18	17.8	17.5	17	15.8	14.8	13.3	11.7	9

It is assumed to fit the equation $y = a + bx + cx^2$, where x is the discharge in litre/sec and y, head in metres of water. Find the values of the constants a,b, and c. [04] CO2

Course Outcomes

CO1. Introduce the basic concept of Computational methods and their uses in engineering.
CO2. Enable the students to understand the concept of errors and their analysis in Numerical calculations.
CO3. Understand the methods of interpolation and extrapolation and their applications in engineering.
CO4. Understand the Numerical Differentiation and Numerical Integration and their uses in Engineering.
CO5. Understand the Numerical solution of ordinary differential equations which are useful to all branches of engineering.

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Mathematics
B. Tech. CSE Semester IV Minor I Examination (Even) 2018-19

Entry No: 17BCS045 Total Number of Pages: [01]
Date: 07/02/2019 Total Number of Questions: [05]

Course Title: ENGINEERING COMPUTATIONAL METHODS
Course Code: MTL 2025

Time Allowed: 1.5 Hours **Max Marks: [20]**

Instructions / NOTE

i. Attempt All Questions.
ii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.
iii. Use of IS Code (Scientific calculator) is permissible in examination.

Q1. (a) Explain the working procedure to fit the parabola by the method of least squares. [02] CO1

(b) Geometrically explain the Newton-Raphson method. [02] CO1

Q2. Estimate y at $x = 2.25$ *and* 3.04 by fitting the indifference curve of the form $xy = Ax + B$ to the following data:

x	1	2	3	4
y	3	1.5	6	7.5

[04] CO2

Q3. a) Find a real root of $2x - log_{10}x = 7$ correct to four decimal places using iteration method. [02] CO2

b) Find the secant method formula for finding the square root of a positive real number R. [02] CO2

Q4. a) Solve $x^3 + 2x^2 + 10x - 20 = 0$ by Newton-Raphson method. [02] CO2

b) Find the iterative formulae for finding $\sqrt[3]{N}, where$ N is a positive real number, using Newton's method. Hence evaluate $\sqrt[3]{25}$ [02] CO2

Q5. Solve the equations $5x + 2y + z = 12,; x + 4y + 2z = 15;$ $x + 2y + 5z = 20$ by a) Jacobi's and b) Gauss-Seidal methods [04] CO2

Course Outcomes

CO1. Introduce the basic concept of Computational methods and their uses in engineering.
CO2. Enable the students to understand the concept of errors and their analysis in Numerical calculations.
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SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Mathematics
B. Tech. CSE Semester IV Minor II Examination (Even) 2018-19

Entry No: 1 1 B C 3 0 4 5
Date: 19/03/2019

Total Number of Pages: [02]
Total Number of Questions: [05]

Course Title: ENGINEERING COMPUTATIONAL METHODS
Course Code: MTL 2025

Time Allowed: 1.5 Hours **Max Marks: [20]**

Instructions / NOTE

vii. Attempt All Questions.
viii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.
ix. Use of IS Code (Scientific calculator) is permissible in examination.

Q1. (a) What do you mean by finite differences. [01] CO3

(b) Define Shift operator and averaging operator. [01] CO3

(c) Define Interpolation and Extrapolation. [01] CO3

Q2. a) Suppose that $f(x)$ be an interpolating polynomial satisfying the following data. Find the $f(x)$ and its value for $x = 2.5$ *and* 5.

x	0	1	2	3	4
y	2	3	12	35	78

[2.5] CO3

b) From the following data, find x when y=5 using iterative method.

x	1.8	2.0	2.2	2.4	2.6
y	2.9	3.6	4.4	5.5	6.7

[2.5] CO3

Q3. Prove with usual notations i) $\Delta = \frac{1}{2}\delta^2 + \delta\sqrt{\left(1 + \delta^2/4\right)}$, ii) $\Delta^3 y_2 = \nabla^3 y_5$,

iii) $\delta^2(1+\Delta) = \Delta^2$, iv) $\delta\left(y_{\frac{n+1}{2}} + y_{\frac{n-1}{2}}\right) = 2\delta\mu y_n$ [04] CO3

Q4. Values of x (in degrees) and $Sin\ x$ are given in the following table. Determine the value of $Sin\ 38$

x	15	20	25	30	35	40
Sin x	.2588190	.3420201	.4226183	.5	.5735764	.6427876

[03] CO3

Q5. i) Derive the Newton's Divided Difference formula. [02] CO2

ii) Using Newton's divided difference formula, evaluate $f(8)$ and $f(15)$ given that

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

[03] CO3

Course Outcomes

CO1. Introduce the basic concept of Computational methods and their uses in engineering.
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SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Mathematics
B. Tech. MAJOR Examination (Even) 2018-19

Entry No: 1 1 B C S 0 4 5

Total Number of Pages: [01]

Date: 16/05/2019

Total Number of Questions: [05]

Course Title: ENGINEERING COMPUTATIONAL METHODS

Course Code: MTL 2025

Time Allowed: 3.0 Hours **Max Marks: [50]**

Instructions / NOTE

i. Attempt All Questions.
ii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.
iii. Use of IS Code (Scientific calculator) is permissible in examination.

Section - A

Q1. Define the following terms:

(a) Write down the normal equations to fit a quadratic equation by least square method. [02] CO3

(b) Geometrically explain the Newton-Raphson method. [02] CO3

(c) Write the relation between E and Δ. [02] CO2

(d) What is principle of least squares? [02] CO2

(e) What do you mean by Finite differences? [02] CO3

Section - B

Q2. (a) A rocket is launched from the ground. Its acceleration is registered during the first 80 seconds and is given in the table below. Using Simpson's 1/3 rule and Simpson's 3/8 rule, find the velocity and height of the rocket at t=80 and 10. [05] CO4

t(s)	0	10	20	30	40	50	60	70	80
a(m/s^2)	30	31.63	33.64	35.47	37.75	40.33	43.25	46.69	50.67

[02] CO4

b) Derive General Quadrature formula for equidistant ordinates.

Q3. (a) Find an approximate value of y when $x = 0.1$, if $\frac{dy}{dx} = x - y^2, y(0) = 1$ using i) Picard's method and ii) Taylor's series. [04] CO4

b) Solve by Gauss-Seidel method, the following system of equations:
$28x - 4y - z = 32; x + 3y + 10z = 24; 2x + 17y + 4z = 35$ [04] CO4

c) Apply Gauss-Jordan method to solve the equations:
$x + y + z = 9; 2x - 3y + 4z = 13; 3x + 4y + 5z = 40$ [04] CO4

Q4. a) Given the following data, find the maximum value of y

X	-1	1	2	3
y	-21	15	12	3

[02] CO3

b) Compute the missing terms in the following table:

x	2	3	4	5	6	7	8
$f(x)$	0.135	-	0.111	0.100	-	0.082	0.074

[05] CO2

Q6. a) Explain the Iteration method. [02] CO1

b) Using Newton-Raphson method, find a root correct to three decimal places of the equation $xe^x - cosx = 0$. [05] CO2

Q7. a) Find $f(x)$ as a polynomial in x for the following data by Newton's divided difference formula

x	-4	-1	0	2	5
$f(x)$	1245	33	5	9	1335

[03] CO3

b) While testing a centrifugal pump, the following data is obtained.

x	2	2.5	3	3.5	4	4.5	5	5.5	6
y	18	17.8	17.5	17	15.8	14.8	13.3	11.7	9

It is assumed to fit the equation $y = a + bx + cx^2$, where x is the discharge in litre/sec and y, head in metres of water. Find the values of the constants a,b, and c. [04] CO2

Course Outcomes

CO1. Introduce the basic concept of Computational methods and their uses in engineering.
CO2. Enable the students to understand the concept of errors and their analysis in Numerical calculations.
CO3. Understand the methods of interpolation and extrapolation and their applications in engineering.
CO4. Understand the Numerical Differentiation and Numerical Integration and their uses in Engineering.
CO5. Understand the Numerical solution of ordinary differential equations which are useful to all branches of engineering.

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Mathematics
B. Tech. ME Semester III Minor/Mid Term Examination (Odd) 2018-19

Entry No: 18BME029
Date: 30/09/2019

Total Number of Pages: [02]
Total Number of Questions: [05]

Course Title: ENGINEERING COMPUTATIONAL METHODS
Course Code: MTL 2025

Time Allowed: 1.5 Hours **Max Marks: [20]**

Instructions / NOTE
i. Attempt All Questions.
ii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.
iii. Use of IS Code (Scientific calculator) is permissible in examination.

Q1.	(a) What is principle of least squares?	[01]	CO2
	(b) Define Shift operator and averaging operator.	[01]	CO2
	(c) Define Interpolation and Extrapolation.	[01]	CO3
	(d) What do you mean by Inverse Interpolation?	[01]	CO3
	(e) What do you mean by Finite differences?	[01]	CO3
	(f) What is Iterative formula to find $\sqrt[k]{N}$?	[01]	CO2
Q2.	a) Convert the following equations to their linear form: i) $y = ax + bx^2$ ii) $y = \frac{b}{[x(x-a)]}$	[02]	CO3
	b) Certain corresponding values of x and $log_{10}x$ are given below. Find $log_{10}310$ by Lagrange's and Newton's divided difference formulae.	[05]	CO3

x	300	304	305	307
$log_{10}x$	2.4771	2.4829	2.4843	2.4871

Q3.	a) Solve the following equations by Gauss-Seidal method: $83x + 11y - 4z = 95;\ 7x + 52y + 13z = 104;\ 3x + 8y + 29z = 71$	[03]	CO3
	b) Evaluate i) $\sqrt{32}$, and ii) the cube root of 41 to four places of decimal, using Newton's Raphson method.	[03]	CO3
Q4.	a) Using Newton's Iterative method, find the real root of $xlog_{10}x = 1.2$ correct to five decimal places.	[03]	CO3
	b) Apply Lagrange's method to find the value of x when $f(x) = 15$ from the given data:	[03]	CO3

x	5	6	9	11
$y = f(x)$	12	13	14	16

Q5.	a) Derive the Newton's Divided Difference formula.	[03]	CO2
	b) Solve the following equations by Gauss-Jordan method: $2x - 3y + z = -1;\ x + 4y + 5z = 25;\ 3x - 4y + z = 2$	[03]	CO3

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Mathematics
B.TECH. (Mechanical) Major Examination (Odd Semester) 2019-20

Entry No: 18BME029 Total Number of Pages: [02]
Date: Total Number of Questions: [07]

Course Title: Engineering Computational Methods
Course Code: MTL 2025

Time Allowed: 3.0 Hours Max Marks: [50]

Instructions:
i. Attempt All Questions.
ii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.
iii. Assume any missing data to suit the case / derivation / answer.
iv. Use of Calculator is permissible in the examination.

Section – A

Q1. (a) Express the backward difference operator ∇ in terms of shift operator E. [01]

(b) Write down name of two iterative methods used to solve system of linear equations. [01]

(c) What is the formula used to integrate a function by using Trapezoidal rule? [01]

(d) Which method requires initial approximation to find out root of an equation? [01]

(e) What is the formula to find out $\frac{dy}{dx}$ at $x = x_n$ by using Newton's backward difference formula? [01]

Q2. (a) Explain geometrically the method of regula falsi to find out root of an equation. [05]

(b) Formulate Simpson's 3/8 rule by using Newton's forward difference formula. [05]

Section – B

Q3. (a) Show that $\Delta = \nabla(1-\nabla)^{-1}$, where Δ and ∇ are forward and backward difference operators respectively. [04]

(b) Determine the constants a and b by the least square method such that $y = ae^{bx}$ fits the following data:

x	1.0	1.2	1.4	1.6
y	40.170	73.196	133.372	243.02

[04]

Q4. (a) Using Gauss's forward formula, find the value of $f(32)$ given that $f(25)$ 0.2707, $f(30) = 0.3027$, $f(35) = 0.3386$, $f(40) = 0.3794$. [04]

(b) Find $\frac{dy}{dx}$ when $x = 1$ from the following table: [04]

x	0	1	2	3	4	5	6
y	6.9897	7.4036	7.7815	8.1291	8.4510	8.7506	9.0309

Q5. If $\frac{dy}{dx} = \frac{1}{x^2+y}$ with $y(4) = 4$, compute the value of $y(4.2)$ by using Taylor's series method. [06]

Q6. Given that $y' = x(1 + x^3y)$, $y(0) = 3$, use Picard's method to find the value of $y(0.1)$. [06]

Q7. From the following table, find out the value of x for which the value of y is maximum:

x	3	4	5	6	7	8
y	0.205	0.240	0.259	0.262	0.250	0.224

[07]

Course Outcomes

CO1. Introduce the basic concept of Computational methods and their uses in engineering.
CO2. Enable the students to understand the concept of errors and their analysis in Numerical calculations.
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CO4. Understand the Numerical Differentiation and Numerical Integration and their uses in Engineering.
CO5. Understand the Numerical solution of ordinary differential equations which are useful to all branches of engineering.