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**B.Tech. Degree III Semester Regular/Supplementary Examination
in Marine Engineering November 2024**

**19-208-0301 ENGINEERING MATHEMATICS-III
(2019 Scheme)**

Time: 3 Hours

Maximum Marks: 60

Course Outcome

On successful completion of the course, the students will be able to:

- CO1: Transform a region to another region using conformal mapping and calculate residues.
- CO2: Understand different sampling distributions for statistical analysis of data and fit a best curve to the data.
- CO3: Solve algebraic and transcendental equations and differential equations by numerical methods.
- CO4: Solve difference equations and apply it to engineering problems.
- CO5: Perform numerical differentiation and integration.

Bloom's Taxonomy Levels (BL): L1 – Remember, L2 – Understand, L3 – Apply, L4 – Analyze, L5 – Evaluate, L6 – Create
PI – Programme Indicators

(Answer ALL questions)

(5 × 15 = 75)

		Marks	BL	CO	PI
I. (a)	Check whether the function $f(z) = \begin{cases} \frac{\text{Re}(z^2)}{ z ^2}, & z \neq 0 \\ 0, & z = 0 \end{cases}$ and $f(z) = 0$ for $z = 0$ is continuous at $z = 0$.	7	L1	1	1
(b)	Find an analytic function $f(z)$ whose real part is $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$.	8	L2	1	1
OR					
II. (a)	Find the Laurent's series expansion of $f(z) = \frac{1}{(z-2)(z-3)}$ in the region $2 < z < 3$.	8	L2	1	1
(b)	Using residue theorem evaluate the $\int_C \frac{z^2}{z-2} dz$ where C is the circle $ z = 3$.	7	L2	1	1
III. (a)	Define the following terms (i) Population. (ii) Sample. (iii) Statistic. (iv) Parameter.	6	L1	2	1
(b)	Find the correlation coefficient between x and y for the given data.	9	L3	2	1

x	1	2	3	4	5	6	7	8	9	10
y	10	12	16	28	25	36	41	49	40	50

OR

(P.T.O.)

BT MRE-III(R/S)-11-24-3438

	Marks	BL	CO	PI																
IV. (a) Fit a straight line $y=ax+b$ to the following data.	6	L2	2	1																
<table border="1"> <tr> <td>x</td> <td>12</td> <td>15</td> <td>21</td> <td>25</td> </tr> <tr> <td>y</td> <td>50</td> <td>70</td> <td>100</td> <td>120</td> </tr> </table>					x	12	15	21	25	y	50	70	100	120						
x	12	15	21	25																
y	50	70	100	120																
(b) The two regression equations of the variable x and y are $x = 19.13 - 0.87y$ and $y = 11.64 - 0.50x$. Find	9	L2	2	1																
(i) mean of x's.																				
(ii) mean of y's.																				
(iii) the correlation coefficient between x and y.																				
V. (a) Find a real root of the equation $x^3 - 4x - 9 = 0$ correct to four decimal places by bisection method.	8	L2	3	1																
(b) Use Regula Falsi method to solve $x - \cos(x) = 0$ correct to 3 decimal places.	7	L2	3	1																
OR																				
VI. (a) Find the real positive root of $3x - \cos(x) - 1 = 0$ by Newton-Raphson method.	7	L2	3	1																
(b) Solve $\frac{dy}{dx} = x + y$, given $y(1) = 0$, and get $y(1.1)$.	8	L2	3	1																
VII. (a) Using Lagrange's formula express the function $\frac{3x^2 + x + 1}{(x-1)(x-2)(x-3)}$ as a sum of partial fractions.	8	L2	4	1																
(b) Express $x^3 - 3x^2 + 5x + 7$ in terms of factorial notation.	7	L2	4	1																
OR																				
VIII. (a) Solve the difference equation $y_{n+2} - 4y_n = 9n^2$.	8	L2	4	1																
(b) Solve the equation $y_{n+2} - 4y_{n+1} + 3y_n = 3^n$.	7	L2	4	1																
IX. (a) Using Newton's forward formula, find the value of $f(21)$, if	7	L2	5	1																
<table border="1"> <tr> <td>x</td> <td>20</td> <td>23</td> <td>26</td> <td>29</td> </tr> <tr> <td>y</td> <td>0.3420</td> <td>0.3907</td> <td>0.4384</td> <td>0.4848</td> </tr> </table>					x	20	23	26	29	y	0.3420	0.3907	0.4384	0.4848						
x	20	23	26	29																
y	0.3420	0.3907	0.4384	0.4848																
(b) Using Lagrange's interpolation formula to find the value of y when $x = 10$ from the following table:	8	L3	5	1																
<table border="1"> <tr> <td>x</td> <td>5</td> <td>6</td> <td>9</td> <td>11</td> </tr> <tr> <td>y</td> <td>12</td> <td>13</td> <td>14</td> <td>16</td> </tr> </table>					x	5	6	9	11	y	12	13	14	16						
x	5	6	9	11																
y	12	13	14	16																
OR																				
X. (a) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using trapezoidal rule, given that,	7	L2	5	1																
<table border="1"> <tr> <td>x</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>f(x)</td> <td>1</td> <td>0.5</td> <td>0.2</td> <td>0.1</td> <td>0.0588</td> <td>0.0385</td> <td>0.027</td> </tr> </table>					x	0	1	2	3	4	5	6	f(x)	1	0.5	0.2	0.1	0.0588	0.0385	0.027
x	0	1	2	3	4	5	6													
f(x)	1	0.5	0.2	0.1	0.0588	0.0385	0.027													
(b) Use Newton's divided difference formula to find $f(3)$ from the following table.	8	L2	5	1																
<table border="1"> <tr> <td>x</td> <td>0</td> <td>1</td> <td>2</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>f(x)</td> <td>1</td> <td>14</td> <td>15</td> <td>5</td> <td>6</td> <td>19</td> </tr> </table>					x	0	1	2	4	5	6	f(x)	1	14	15	5	6	19		
x	0	1	2	4	5	6														
f(x)	1	14	15	5	6	19														

Blooms's Taxonomy Level

L1 - 10%, L2 - 80%, L3 - 10%.