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**BTECH**  
**(SEM III) THEORY EXAMINATION 2021-22**  
**MATHEMATICS-III**

**Time: 3 Hours****Total Marks: 70****Note: 1. Attempt all Sections. If require any missing data; then choose suitably.****SECTION A****1. Attempt all questions in brief.****2 x 7 = 14**

a.	Define Harmonic function.
b.	Define the coefficients of Kurtosis.
c.	Discuss normal equation of the curve $y = ax + b$ .
d.	Write Regula -false Method of iterative formula.
e.	Explain the Method of least square.
f.	What do you mean by initial value problem?
g.	Write the definition of Z - transform.

**SECTION B****2. Attempt any three of the following:****7 x 3 = 21**

a.	Using Cauchy's Residue Theorem Evaluate $\int_C \frac{z+1}{(z-1)(z-2)} dz$ , where C is the circle $ z  = 3$ .												
b.	Calculate the equations of the lines of regression for the data: <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>x</td> <td>6</td> <td>2</td> <td>10</td> <td>4</td> <td>8</td> </tr> <tr> <td>y</td> <td>9</td> <td>11</td> <td>5</td> <td>8</td> <td>7</td> </tr> </table>	x	6	2	10	4	8	y	9	11	5	8	7
x	6	2	10	4	8								
y	9	11	5	8	7								
c.	Using Newton Raphson method, find the real root of the equation $3x = \cos x + 1$ correct to four decimal places.												
d.	Solve the initial value problem $\frac{dy}{dx} = 2x + y, y(0) = 1$ with $h = 0.1$ on the interval $[0, 0.2]$ By using Runge – Kutta method.												
e.	Determine the Fourier cosine transform of $\frac{1}{1+x^2}$ and hence find Fourier sine transform of $\frac{x}{1+x^2}$ .												

**SECTION C****3. Attempt any one part of the following:****7 x 1 = 7**

(a)	Determine an analytic function $f(z) = u + iv$ in terms of $z$ , whose real part is $e^x \cos y$ .
(b)	State and Prove Cauchy's integral Theorem.

**4. Attempt any one part of the following:****7 x 1 = 7**

(a)	The first four moments about the value 4 of a distribution are 7, 1.5, 2.6 and 8.8. Calculate the moments about the mean.
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(b)	Calculate the equations of the lines of regression for the data:												
	<table border="1"> <tr> <td>x</td><td>6</td><td>2</td><td>10</td><td>4</td><td>8</td> </tr> <tr> <td>y</td><td>9</td><td>11</td><td>5</td><td>8</td><td>7</td> </tr> </table>	x	6	2	10	4	8	y	9	11	5	8	7
x	6	2	10	4	8								
y	9	11	5	8	7								

5. Attempt any *one* part of the following:

7 x 1 = 7

(a)	The following tables gives the population for following years:														
	<table border="1"> <tr> <td>Year</td><td>1901</td><td>1911</td><td>1921</td><td>1931</td><td>1941</td><td>1951</td> </tr> <tr> <td>Population(in thousands)</td><td>12</td><td>15</td><td>20</td><td>27</td><td>39</td><td>52</td> </tr> </table>	Year	1901	1911	1921	1931	1941	1951	Population(in thousands)	12	15	20	27	39	52
Year	1901	1911	1921	1931	1941	1951									
Population(in thousands)	12	15	20	27	39	52									
	Use Newton's backward difference interpolation formula to find the population for the year 1951.														
(b)	Find the real root of the equation $(17)^{\frac{1}{3}}$ correct to four decimal places using Newton-Raphson method.														

6. Attempt any *one* part of the following:

7 x 1 = 7

(a)	Solve the following system of linear equations using Gauss-Seidel method: $x+5y+10z=10$ $10x+6y-z=35$ $6x+10y+2z=22.$
(b)	Solve $\int_0^2 \frac{dx}{x^2+x+1}$ by using Simpson's one third rule.

7. Attempt any *one* part of the following:

7 x 1 = 7

(a)	Solve by Z-transform the difference equation: $y_{k+2} - 3y_{k+1} + 2y_k = 0$ , with $y_0 = 0, y_1 = 1$ by using Z-transform
(b)	State and prove convolution theorem of Z-Transform.