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BTECH
(SEM IV) THEORY EXAMINATION 2023-24
MATHEMATICS-V**TIME: 3 HRS****M.MARKS: 70****Note:** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.****2 X7 = 14**

a.	Define Fourier transform.
b.	Find Laplace transform of $t \sin t$.
c.	State the condition when Binomial distribution becomes Poisson distribution.
d.	Write divided difference formula for $f(x)$ which takes only three points x_0, x_1 and x_2 .
e.	Show that $\Delta = \nabla E$.
f.	Define chi square test.
g.	What is the objective of experimental design.

SECTION B**2. Attempt any three of the following:****7X3=21**

a.	Explain the following (i) Z transform (ii) Modulation property of Fourier transform.																		
b.	Compute k, mean and variance from following probability distribution: <table border="1" style="margin-left: 20px;"> <tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr><td>f(x)</td><td>k</td><td>2k</td><td>3k</td><td>k</td></tr> </table>	x	1	2	3	4	f(x)	k	2k	3k	k								
x	1	2	3	4															
f(x)	k	2k	3k	k															
c.	Explain Regula Falsi method with its applications and limitation.																		
d.	Discuss whether the nature of area is related to voting preference in the election for which the data is given <table border="1" style="margin-left: 20px;"> <tr><td>Area</td><td>A</td><td>B</td><td>Total</td></tr> <tr><td>Rural</td><td>620</td><td>480</td><td>1100</td></tr> <tr><td>Urban</td><td>380</td><td>520</td><td>900</td></tr> </table> <p>Given that $\chi_{0.05}^2 = 3.84$.</p>	Area	A	B	Total	Rural	620	480	1100	Urban	380	520	900						
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Rural	620	480	1100																
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e.	The following table gives 15 samples plots under three groups. Could we conclude that there is a significant variation? You may use tabulated value of $F(2,12) = 3.88$. <table border="1" style="margin-left: 20px;"> <tr><td>Variety I</td><td>15</td><td>10</td><td>14</td><td>15</td><td>12</td></tr> <tr><td>Variety II</td><td>12</td><td>11</td><td>16</td><td>10</td><td>11</td></tr> <tr><td>Variety III</td><td>9</td><td>10</td><td>15</td><td>14</td><td>10</td></tr> </table>	Variety I	15	10	14	15	12	Variety II	12	11	16	10	11	Variety III	9	10	15	14	10
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Variety III	9	10	15	14	10														

SECTION C**3. Attempt any one part of the following:****7X1=7**

a.	Find the Fourier cosine transform of $f(x) = \frac{e^{-x}}{x}$.
b.	Using Z transform solve the following difference equation: $y_{k+2} + 3y_{k+1} + 2y_k = 0, y(0) = 1, y(1) = 1$.

4. Attempt any one part of the following:**7X1=7**



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MATHEMATICS-V

TIME: 3 HRS

M.MARKS: 70

a.	Data was collected over a period of 10 years, showing number of deaths from horse kicks in each of the 200 army corps. The distribution of deaths was as follows:					
	No. of Deaths	0	1	2	3	4
	Frequency	109	65	22	3	1
	Determine the Poisson Distribution function corresponding to the data and calculate the theoretical frequency.					
b.	10 coins are tossed 100 times. How many times do you expect to get at least seven heads.					

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

7X1=7

a.	Explain (i) Lagrange interpolation (ii) Divided difference formula
b.	Show that Newton Rhapson method has second order rate of convergence.

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

7X1=7

a.	Discuss whether there is any association between Area and pollution index of the city for which the data is given:			
	Area/Pollution	high	low	Total
	Urban	150	350	500
	Rural	250	350	600
	You may use chi square =3.84 for 1d.f at 5% level of significance.			
b.	Explain t test for one and two samples.			

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

7X1=7

a.	Explain the following terms related to experimental designs: (i) RBD (ii) LSD (iii) CRBD										
b.	Discuss the difference between np-chart and p-chart. Following is the data of defective of 10 samples of size 100 each. Construct np-chart and explain your findings.										
	Sample no.	1	2	3	4	5	6	7	8	9	10
	No. of defectives	4	9	10	6	15	8	6	11	9	6