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

Time: 3 Hours**Total Marks: 100****Note:** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.****2 x 10 = 20**

a.	Write the formula to find Fourier sine transform of derivative of $f(x)$.
b.	Find Z transform of a constant k .
c.	In Poisson distribution if mean of random variable is 4 then find the variance.
d.	Define probability density function.
e.	Write the formula used in Newton Raphson method.
f.	Express $\Delta - \nabla$ in terms of E, E^{-1} .
g.	Find the degree of freedom for Chi square test for a contingency table of order 2×3 .
h.	Define the null hypothesis.
i.	Mention any two objectives of experimental design.
j.	Differentiate between CRD and RBD.

SECTION B**2. Attempt any three of the following:****10x3=30**

1. Attempt any three of the following.

a.	Compute Fourier transform of $f(x) = \begin{cases} \frac{1}{2a}, & x \leq a \\ 0, & x > a \end{cases}$.																						
b.	If 10% of the bolts produced by a machine are defective, determine the probability that out of 10 bolts chosen at random (i) 1 (ii) none (iii) at least one bolt will be defective.																						
c.	Find the cubic Lagrange's interpolating polynomial which takes the following values: <table border="1"> <tr> <td>x</td> <td>0</td> <td>1</td> <td>2</td> <td>5</td> </tr> <tr> <td>f(x)</td> <td>2</td> <td>3</td> <td>12</td> <td>147</td> </tr> </table>	x	0	1	2	5	f(x)	2	3	12	147												
x	0	1	2	5																			
f(x)	2	3	12	147																			
d.	The following table gives the death records of three hospitals <table border="1"> <tr> <td>Hospital A</td> <td>3</td> <td>4</td> <td>3</td> <td>5</td> <td>0</td> </tr> <tr> <td>Hospital B</td> <td>6</td> <td>3</td> <td>3</td> <td>4</td> <td>4</td> </tr> <tr> <td>Hospital C</td> <td>7</td> <td>3</td> <td>4</td> <td>6</td> <td>5</td> </tr> </table> <p>From these data. Discuss about the difference in the number of the deaths per months among three hospitals. Given that the tabulated value of F for 2 and 12 degrees of freedom is 3.88 at 5% level of significance.</p>	Hospital A	3	4	3	5	0	Hospital B	6	3	3	4	4	Hospital C	7	3	4	6	5				
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Hospital B	6	3	3	4	4																		
Hospital C	7	3	4	6	5																		
e.	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. <table border="1"> <tr> <td>Sample no.</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>10</td> </tr> <tr> <td>No. of defectives</td> <td>3</td> <td>4</td> <td>7</td> <td>11</td> <td>3</td> <td>2</td> <td>1</td> <td>5</td> <td>12</td> <td>8</td> </tr> </table>	Sample no.	1	2	3	4	5	6	7	8	9	10	No. of defectives	3	4	7	11	3	2	1	5	12	8
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SECTION C

3. Attempt any one part of the following: 10x1=10

a.	Determine Fourier sine transform of $\frac{e^{-ax}}{x}$, $a > 0$.
b.	Solve the following difference equation: $y_{n+2} + 2y_{n+1} + y_n = n$ given that $y_0 = y_1 = 0$.

4. Attempt any one part of the following: 10x1=10

a.	A manufacture knows from experience that the resistance of resistors he produces is normal with mean 100 ohms and standard deviation 2 ohms. Determine what percentage of resistors will have resistance between 98 ohms and 102ohms.
b.	A random variable x has the following probability function: x: 0 1 2 3 f(x): 3k 2k 2k k Determine (i) k (ii) mean of the distribution.

5. Attempt any one part of the following: 10x1=10

a.	Using Regula-Falsi method, compute the real root of the equation $x^3 - 4x = 9$.						
b.	Using forward difference operator calculate the missing terms in the following data:						
	x	0	5	10	15	20	25
	F(x)	6	10	-	17	-	31

6. Attempt any one part of the following: 10x1=10

a.	A die is thrown some times and the results are observed as: No. appeared on die: 1 2 3 4 5 6 Frequency: 40 32 29 59 57 59 Test whether die is biased or not. Given Chi square of 5% level of significance for 5 degree of freedom is 11.09.
b.	The 9 items of a sample have the following values: 45, 47, 50, 52, 48, 47, 49, 53, 51. Apply t test to check the mean of these values differ significantly from the assumed mean 47.5. Use at 5% level of significance for 8 degree of freedom is 2.31.

7. Attempt any one part of the following: 10x1=10

a.	Explain the following terms: (i) Replication (ii) Randomization (iii) Components of variation in experimental designs.																																	
b.	<p>The following data shows the value of sample mean \bar{X} and range R for 10 samples of size 5 each. Calculate the values for central line and control limits for \bar{X} and R charts. Also determine whether the process is in under control or not.</p> <table><tr><td>Sample no.</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><td>Mean \bar{X}</td><td>11.2</td><td>11.8</td><td>10.8</td><td>11.6</td><td>11</td><td>9.6</td><td>10.4</td><td>9.6</td><td>10.6</td><td>10</td></tr><tr><td>Range R</td><td>7</td><td>4</td><td>8</td><td>5</td><td>7</td><td>4</td><td>8</td><td>4</td><td>7</td><td>9</td></tr></table>	Sample no.	1	2	3	4	5	6	7	8	9	10	Mean \bar{X}	11.2	11.8	10.8	11.6	11	9.6	10.4	9.6	10.6	10	Range R	7	4	8	5	7	4	8	4	7	9
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