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BTECH
(SEM IV) THEORY EXAMINATION 2021-22
MATHS-IV

Time: 3 Hours

Total Marks: 100

Notes:

- Attempt all Sections and Assume any missing data.
- Appropriate marks are allotted to each question, answer accordingly.

SECTION-A	Attempt All of the following Questions in brief	Marks (10X2=20)	CO
Q1(a)	Solve the partial differential equation $p + q = 1$		1
Q1(b)	Calculate particular Integral (P.I.) of $(D - 3D' + 2)z = e^{x+2y}$		1
Q1(c)	Tell the classification of the following partial differential equation $5 \frac{\partial^2 u}{\partial x^2} - 9 \frac{\partial^2 u}{\partial x \partial t} + 4 \frac{\partial^2 u}{\partial t^2} = 0$		2
Q1(d)	Write down the two-dimensional wave equation.		2
Q1(e)	Calculate the moment generating function of the negative exponential function $f(x) = \lambda e^{-\lambda x}; x, \lambda > 0$		3
Q1(f)	If Regression Coefficients are 0.8 and 0.8, what would be the value of coefficient of correlation?		3
Q1(g)	A die is tossed twice, A success is getting 2 or 3 on a toss. Calculate mean		4
Q1(h)	Write Statement of Baye's theorem.		4
Q1(i)	When we use F-test.		5
Q1(j)	Explain one-way ANOVA classification.		5

SECTION-B	Attempt ANY THREE of the following Questions	Marks (3X10=30)	CO												
Q2(a)	Solve the following partial differential equation by Charpit Method: $px + qy = pq$		1												
Q2(b)	Determine the solution of one dimensional heat equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ where the boundary conditions are $u(0,t) = 0, u(l,t) = 0, (t > 0)$ and the initial condition $u(x,0) = 3 \sin \frac{\pi x}{l}$: l being the length of the bar.		2												
Q2(c)	From the following data, determine the equations of line of regression of y on x and x on y . <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <tr> <td style="padding: 2px 10px;">x</td> <td style="padding: 2px 10px;">6</td> <td style="padding: 2px 10px;">2</td> <td style="padding: 2px 10px;">10</td> <td style="padding: 2px 10px;">4</td> <td style="padding: 2px 10px;">8</td> </tr> <tr> <td style="padding: 2px 10px;">y</td> <td style="padding: 2px 10px;">9</td> <td style="padding: 2px 10px;">11</td> <td style="padding: 2px 10px;">5</td> <td style="padding: 2px 10px;">8</td> <td style="padding: 2px 10px;">7</td> </tr> </table>	x	6	2	10	4	8	y	9	11	5	8	7		3
x	6	2	10	4	8										
y	9	11	5	8	7										
Q2(d)	In a test on 2000 electric bulbs, it was found that the life of a particular make, was normally distributed with an average life of 2040 hours and S.D of 60 hours. Calculate the number of bulbs likely to burn for: (i) More than 2150 hours, (ii) less than 1950 hours (iii) between 1920 hours and 2160 hours?		4												
Q2(e)	The 9 items of a sample have the following values: 45,47,50,52,48,47,49,53,51. Does the mean of these values differ significantly from the assumed mean 47.5? [The tabulated value of $t_{0.05} = 2.31$ for 8 d.f.]		5												

SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)	CO
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Q3(a)	Solve the partial differential equation $x^2 \frac{\partial^2 z}{\partial x^2} - y^2 \frac{\partial^2 z}{\partial y^2} = xy$	1
Q3(b)	Use Cauchy's method of characteristics to solve the first order partial differential equation $u_x + u_y = 1 + \cos y$, $u(0, y) = \sin y$	1

SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)	CO
Q4(a)	Solve the following partial differential equation by method of separation of variables: $\frac{\partial u}{\partial t} - \frac{\partial u}{\partial x} + 2u = 0$. $u(x, 0) = 10e^{-x} - 6e^{-4x}$.	2	
Q4(b)	Determine the solution of Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ subject to the boundary conditions $u(0, y) = u(l, y) = u(x, 0) = 0$ and $u(x, a) = f(x)$.	2	

SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)	CO												
Q5(a)	Compute skewness and Kurtosis, if the first four moments of a frequency distribution about the value 4 of the variable are 1, 4, 10 and 45.	3													
Q5(b)	Use the method of least squares to fit the curve $y = c_0x + \frac{c_1}{\sqrt{x}}$ for the following data: <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <tr><td style="padding: 2px 5px;">x</td><td style="padding: 2px 5px;">0.2</td><td style="padding: 2px 5px;">0.3</td><td style="padding: 2px 5px;">0.5</td><td style="padding: 2px 5px;">1</td><td style="padding: 2px 5px;">2</td></tr> <tr><td style="padding: 2px 5px;">y</td><td style="padding: 2px 5px;">16</td><td style="padding: 2px 5px;">14</td><td style="padding: 2px 5px;">11</td><td style="padding: 2px 5px;">6</td><td style="padding: 2px 5px;">3</td></tr> </table>	x	0.2	0.3	0.5	1	2	y	16	14	11	6	3	3	
x	0.2	0.3	0.5	1	2										
y	16	14	11	6	3										

SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)	CO												
Q6(a)	Two urns contain 4 white, 6 blue and 4 white, 5 blue balls respectively. One of the urns is selected at random and a ball is drawn from it. If the ball drawn is white. What is the probability that it was drawn from the (i) first urn (ii) second urn.	4													
Q6(b)	The following table gives the no. of days in a 50 day period during which automobile accidents occurred in a city. <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <tr><td style="padding: 2px 5px;">No. of accidents</td><td style="padding: 2px 5px;">0</td><td style="padding: 2px 5px;">1</td><td style="padding: 2px 5px;">2</td><td style="padding: 2px 5px;">3</td><td style="padding: 2px 5px;">4</td></tr> <tr><td style="padding: 2px 5px;">No. of days</td><td style="padding: 2px 5px;">21</td><td style="padding: 2px 5px;">18</td><td style="padding: 2px 5px;">7</td><td style="padding: 2px 5px;">3</td><td style="padding: 2px 5px;">1</td></tr> </table> Fit a Poisson distribution to the data and calculate the theoretical frequencies.	No. of accidents	0	1	2	3	4	No. of days	21	18	7	3	1	4	
No. of accidents	0	1	2	3	4										
No. of days	21	18	7	3	1										

SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)	CO														
Q7(a)	The demand for a particular spare part in a factory was found to vary from day- to -day. In a sample study the following information was obtained <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <tr><td style="padding: 2px 5px;">Days</td><td style="padding: 2px 5px;">Mon</td><td style="padding: 2px 5px;">Tue</td><td style="padding: 2px 5px;">Wed</td><td style="padding: 2px 5px;">Thurs</td><td style="padding: 2px 5px;">Fri</td><td style="padding: 2px 5px;">Sat</td></tr> <tr><td style="padding: 2px 5px;">No. of parts demanded</td><td style="padding: 2px 5px;">1124</td><td style="padding: 2px 5px;">1125</td><td style="padding: 2px 5px;">1110</td><td style="padding: 2px 5px;">1120</td><td style="padding: 2px 5px;">1126</td><td style="padding: 2px 5px;">1115</td></tr> </table> Use χ^2 -test to test the hypothesis that the number of parts demanded does not depend on the day of the week. [The value of $\chi_{0.05}^2 = 11.07$ for 5 d.f]	Days	Mon	Tue	Wed	Thurs	Fri	Sat	No. of parts demanded	1124	1125	1110	1120	1126	1115	5	
Days	Mon	Tue	Wed	Thurs	Fri	Sat											
No. of parts demanded	1124	1125	1110	1120	1126	1115											



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Q7(b)	<p>Following is the data of defectives of 10 samples of size 100 each.</p> <table border="1" style="margin: 10px auto; border-collapse: collapse;"><tr><td style="padding: 2px 5px;">Sample no.</td><td style="padding: 2px 5px;">1</td><td style="padding: 2px 5px;">2</td><td style="padding: 2px 5px;">3</td><td style="padding: 2px 5px;">4</td><td style="padding: 2px 5px;">5</td><td style="padding: 2px 5px;">6</td><td style="padding: 2px 5px;">7</td><td style="padding: 2px 5px;">8</td><td style="padding: 2px 5px;">9</td><td style="padding: 2px 5px;">10</td></tr><tr><td style="padding: 2px 5px;">No.of defectives</td><td style="padding: 2px 5px;">15</td><td style="padding: 2px 5px;">11</td><td style="padding: 2px 5px;">9</td><td style="padding: 2px 5px;">6</td><td style="padding: 2px 5px;">5</td><td style="padding: 2px 5px;">4</td><td style="padding: 2px 5px;">3</td><td style="padding: 2px 5px;">2</td><td style="padding: 2px 5px;">7</td><td style="padding: 2px 5px;">1</td></tr></table> <p>Construct p-chart and state whether the process is in statistical control.</p>	Sample no.	1	2	3	4	5	6	7	8	9	10	No.of defectives	15	11	9	6	5	4	3	2	7	1	5
Sample no.	1	2	3	4	5	6	7	8	9	10														
No.of defectives	15	11	9	6	5	4	3	2	7	1														