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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><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		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><tr><td>x</td><td>0.2</td><td>0.3</td><td>0.5</td><td>1</td><td>2</td></tr><tr><td>y</td><td>16</td><td>14</td><td>11</td><td>6</td><td>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 follwing table gives the no.of days in a 50 day period during which automobile accidents occurred in a city. <table border="1"><tr><td>No. of accidents</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>No. of days</td><td>21</td><td>18</td><td>7</td><td>3</td><td>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)	<p>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</p> <table><tr><td>Days</td><td>Mon</td><td>Tue</td><td>Wed</td><td>Thurs</td><td>Fri</td><td>Sat</td></tr><tr><td>No. of parts demanded</td><td>1124</td><td>1125</td><td>1110</td><td>1120</td><td>1126</td><td>1115</td></tr></table> <p>Use χ^2-test to test the hypothesis that the number of parts demanded does not depend on the day of the week.</p> <p>[The value of $\chi^2_{0.05} = 11.07$ for 5 d.f]</p>	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)	Following is the data of defectives of 10 samples of size 100 each.										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
Construct p-chart and state whether the process is in statistical control.												