



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><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)	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		5														
<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>				Days	Mon	Tue	Wed	Thurs	Fri	Sat	No. of parts demanded	1124	1125	1110	1120	1126	1115
Days	Mon	Tue	Wed	Thurs	Fri	Sat											
No. of parts demanded	1124	1125	1110	1120	1126	1115											
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 $\chi^2_{0.05} = 11.07$ for 5 d.f]																	



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Q7(b)

Following is the data of defectives of 10 samples of size 100 each.

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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.

QP22EP2-290

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