Roll No: | | | | | | | | | | | | | |

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.		3
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

x	6	2	10	4	8
y	9	11	5	8	7

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 $u_x + u_y = 1 + cosy,\ u(0,y) = siny$	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: $\frac{\partial u}{\partial t} - \frac{\partial u}{\partial x} + 2u = 0.\ u(x,0) = 10e - 6e^{-4x}$.		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 $y = c_0 x + \frac{c_1}{\sqrt{x}}$ for the following data:		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 occured in a city.		4

No. of accidents	0	1	2	3	4
No. of days	21	18	7	3	1

Fit a Poisson distribution to the data and calculate the theoretical frequencies.

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

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 $\chi^2_{0.05} = 11.07\ for\ 5d.f$]

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Q7(b)	Following is the data of defectives of 10 samples of size 100 each. Construct p-chart and state whether the process is in statistical control.	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