PAPER ID-311273

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

BTECH
(SEM III) THEORY EXAMINATION 2023-24
MATHEMATICS-IV

TIME: 3HRS **M.MARKS: 70**

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 7 = 14**

Q no.	Question	Marks	CO
a.	Determine the partial differential equation from the equation $z = f(2x - y)$.	2	1
b.	Classify the following partial differential equation $u_{tt} + tu_{xt} + xu_{xx} + 2u_t + u_x + 6u = 0$.	2	2
c.	Write the normal equations to fit the curve $y = \frac{c_0}{x} + c_1\sqrt{x}$.	2	3
d.	Find expected mean for the following probability distribution: x: 8, 12, 16, 20, 24; $p(x)$: 1/8, 1/6, 3/8, 1/4, 1/12	2	4
e.	If $f(x)$ has probability density function as $px^4, 0 < x < 1$ then calculate p.	2	4
f.	Explain null hypothesis.	2	5
g.	Describe control limits of R-chart.	2	5

SECTION B

2. Attempt any *three* of the following: **7 x 3 = 21**

a.	Solve $y^2(x+y)p + x^2(x+y)q = (x^2+y^2)z$.	7	1
b.	Use separation of variables method to solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ subject to the boundary conditions $u(0,y) = u(5,y) = u(x,0) = 0$ and $u(x,b) = \sin\frac{n\pi x}{5}$.	7	2
c.	The first four moments of a distribution about the value 5 of the variable are 2, 20, 40 and 50. Comment upon the skewness and kurtosis of the distribution.	7	3
d.	If X is a Poisson variate such that P(X=2)=9P(X=4)+90P(X=6), find the standard deviation.	7	4
e.	The mean life of 10 motors was found to be 1450hrs with S.D. of 423hrs. A second sample of 17 motors chosen from a different batch showed a mean life of 1280hrs with a S.D. of 398hrs. Is there a significant difference between means of the two samples? (Given $t_{0.05}$=2.13)	7	5

SECTION C

3. Attempt any *one* part of the following: **7 x 1 = 7**

a.	Solve the partial differential equation $px + qy = pq$.	7	1
b.	Solve: $(D^2 + DD' - 6D'^2)z = \cos(2x + y)$.	7	1

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4. Attempt any *one* part of the following: **7 x 1 = 7**

a.	A tightly stretched string with fixed end points x=0 and x=2 is initially in a position given by $y=\sin^3\frac{\pi x}{2}$. If it is released from rest from this position, find the displacement $y(x,t)$.	7	2
b.	Solve the equation $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}, x>0, t>0$ under the conditions (i)$u(0,t)$=0 (ii) $u(x,0)=\begin{cases}x, 0\le x\le 1\\ 0, x\ge 1\end{cases}$ (iii)$u(x,t)$ is bounded.	7	2

5. Attempt any *one* part of the following: **7 x 1 = 7**

a.	Using the method of least squares to fit a curve of the form $y=ae^{bx}$ to the following data: x: 1, 2, 3, 4, 5 y: 1, 1.2, 1.8, 2.5, 3.6	7	3
b.	Two lines of regression are given by $x+2y-5=0$ and $2x+3y-8=0$ and $\sigma_x^2=12$ Calculate (a)the mean values of x and y (b) variance of y (c) the coefficient of correlation between x and y.	7	3

6. Attempt any *one* part of the following: **7 x 1 = 7**

a.	Out of 320 families with 5 children each, how many families would be expected to have (i) 2 boys and 3 girls (ii) at least one boy? Assume equal probability for boys and girls.	7	4
b.	The daily wages of 1000 workers are distributed around a mean of Rs.140 and with a standard deviation of Rs.10. estimate the number of workers whose daily wages will be (i)between Rs.140 and Rs.144 (ii)less than Rs.126 (iii)more than Rs.160	7	4

7. Attempt any *one* part of the following: **7 x 1 = 7**

a.	The following table gives the classification of 50 workers corresponding to their gender and nature of the work. Discuss the nature of work is independent of the gender of the workers: Male: skilled 10, Un skilled 20 Female: skilled 25, Un skilled 20	7	5
b.	In a manufacturing process, the number of defective items found in the inspection of 10 samples of the size 100 each. Construct *np*-chart and give your comments. Sample no.: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 No. of defectives: 6, 9, 12, 5, 12, 8, 8, 16, 13, 7	7	5