Name. ______________________________	Printed Pages:02
Student Admn. No.: ______________________	

School of Basic & Applied Sciences

Backlog Examination, June 2023

[Programme: B.Tech (Civil/CSE)] [Semester: IV] [Batch:All]

Course Title: Probability & Statistics	**Max Marks: 100**
Course Code: MATH2003	**Time: 3 Hrs.**

Instructions:

1. *All questions are compulsory.*
2. *Assume missing data suitably, if any.*

		K Level	COs	Marks
	SECTION-A (15 Marks) — 5 Marks each			
1.	A die is rolled once, let A be the event that an even number turns up and let B be the event that a number divisible by 3 occurs. Find P(A ∪ B) and P(A ∩ B).	K2	CO1	5
2.	*Let X* and Y be two independent random variables and E(X)=5, E(Y)=8 and V(X)=2, V(Y)=2 respectively. Define a random variable Z = 5X + 2Y.	K2	CO2	5
3.	Let a random variable Y have the following p.m.f.: x: 0 1 2 3 4 f(x): 1/3 1/4 1/24 1/8 1/4 Find the expected value of Z = *(Y* + 1).	K3	CO2	5
	SECTION-B (40 Marks) — 10 Marks each			
4.	The joint pdf of the two dimentional random variable (X, Y) is given by $f(x,y) = \begin{cases} 8xy, & 0 < x \leq y < 1 \\ 0, & othewise \end{cases}$ Obtain the marginal pdf of X and Y.	K3	CO3	10
5.	Show that the line of best fit to the following data is given by Y= -0·5X + 8 X: 6, 7, 7, 8, 8, 8, 9, 9, 10 Y: 5, 5, 4, 5, 4, 3, 4, 3, 3	K4	CO3	10
6.	The probability that a patient recovers from a rare blood disease is 0.4. If 15 people are known to have contracted this disease, what is the probability that (a) at least 10 survive, (b) from 3 to 8 survive?	K4	CO4	10
7.	The following are the weights, in decagrams, of 10 packages of grass seed distributed by a certain company: 46.4, 46.1, 45.8, 47.0, 46.1, 45.9, 45.8, 46.9, 45.2, and 46.0. Find a 95% confidence interval for the mean of the weights of all such packages of grass seed distributed by this company, assuming a normal population OR A machinist is making engine parts with axle diameters of 0·700 inch. A random sample of 10 parts shows a mean diameter of 0·742 inch with a standard deviation of 0·040 inch. Compute the statistic you would use to test whether the work is meeting the specifications. Also find the 95% confidence interval in which most of the mean axle diameter lie. [Given that Tabulated $t_{0.05}$ for (10 - 1) i.e., 9 d.f. for two-tailed test is 2·262].	K4	CO4	10

SECTION-C (45 Marks) 15 Marks each				
8.	Suppose the observations of X and Y is given as: X: 59 65 45 52 60 62 70 55 45 49 Y: 75 70 55 65 60 69 80 65 59 61 Where, n = 10 students, and Y =Marks in Mathematics, X =Marks in Economics. Obtain the rank correlation coefficient in the marks of the students for Mathematics and Economics?	K4	CO4	15
9.	The theory predicts the proportion of beans in the four groups A, B, C and D should be 9:3:3:1. In an experiment among 1600 beans, the numbers in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory? [χ20.05 for 3 d.f. = 7·815]	K5	CO4	15
10	Let $X_1, X_2, \ldots, X_n$ be a random sample of size n from a Poisson population having probability mass function, $f(x, \lambda) = \frac{e^{-\lambda}\ \lambda^x}{x!}, \quad x = 0, 1, 2, \ldots$ Show that the maximum likelihood estimator for λ is the sample mean. OR Let $x_1, x_2, \ldots, x_n$ be a random sample of size n from a normal population with parameters(μ, σ^2). Prove that the distribution of sample mean $\bar{x}$ is also normal with parameters$(\mu, \sigma^2/n)$.	K5	CO5	15