Reg. No.: .....

Name: .....

University of Kerala

W7093

Third Semester FYUGP Degree Examination, November 2025

Discipline Specific Core Course

STATISTICS

UK3DSCSTA206-BASIC STATISTICS-III

Academic Level: 200-299

2024 Admission

Time: 1 Hour 30 Minutes(90 Mins.) **Max. Marks: 42**

Part A 6 Marks.Time:6 Minutes.(Cognitive Level:Remember(RE)/Understand(UN)) Objective Type. 1 Mark Each.Answer all questions

Qn.No.	Question	CL	CO
1	The mean of a geometric distribution with parameter p is …….	RE	2
2	CRD stands for ..... in the design of experiments.	RE	3
3	The exponential distribution is known for its …….. property.	UN	2
4	If$M_x(t) = M_y(t)$, what is true about X and Y? Options : A)They have the same mean B)They are independent C)They have the same distribution D)They are continuous.	UN	1
5	In CRD, each treatment is assigned to exactly one experimental unit. True/False?	UN	4
6	What property of the **Geometric distribution** implies the past history of failures does not affect the future probability of success?	UN	2

Part B 8 Marks.Time:24 Minutes.(Cognitive Level:Understand(UN)/Apply(AP))Short Answer. 2 marks each.Answer all questions

Qn.No.	Question	CL	CO
7	Explain the additive property of Gamma distribution.	UN	3
8	State the assumptions of ANOVA.	UN	3
9	Derive the mean of geometric distribution using MGF.	AP	2
10	An MGF is$M_x(t) = (1 - 10t)^{-1}$. Identify the **variance Var(X)** of this Exponential distribution.	AP	2

Part C 28 Marks.Time:60 Minutes (Cognitive Level:Apply(AP)/Analyse(AN)/Evaluate(EV)/Create(CR)) Long Answer.7 marks each.Answer all 4 Questions choosing among options * within each question

Qn.No.	Question	CL	CO
11	A) The following table gives the yields of three strains of wheat cultivated in five identical plots each. Examine whether there is any indication of the strains differing in yield A 20 21 23 16 20 B 18 20 17 15 25 C 25 28 22 28 32 OR B) State the lack of memory property of exponential distribution.The lifetime of a smart light bulb follows an Exponential distribution with an average life of 1,000 hours. The bulb has been operating successfully for 500 hours. Calculate the probability that it survives **an additional 1,000 hours**, $P(T > 1500 \mid T > 500)$.	AP	3
12	A) The time (in years) required for an investment to reach a certain threshold, when compounding occurs over 4 independent phases, follows a Gamma distribution. Each phase has a common rate of λper year. a. Derive the moment generating function of X? Hence deduce the mean and variance? b. If the rate parameter were λ=1 and λ=0.5 for all 4 phases, calculate the **variance Var(T′)**. How does increasing the rate λ impact the variability of the total time? OR B) A new dietary supplement succeeds in producing a desired effect in a trial with probability p. X is the number of trials until the first success. a. Calculate the **Expected number of trials, E[X]**, and the **Variance, Var(X)**. b. Numerically compare the ratio of the mean to the variance for both p=0.20 and p′=0.40. How does increasing the success probability affect the	AN	2

Qn.No.	Question	CL	CO
	relative spread of the distribution?		
13	A) Compare the properties of expectation and variance. If E(X)=10 and Var(X)=16, find the mean and variance of Y=3X−4. OR B) Derive the moment generating function (MGF) of the gamma distribution and then obtain the first two moments using MGF.	EV	1
14	A) Construct an example from real life where the hypergeometric distribution is the best fit. Define the parameters of hypergeometric distribution. Write down the pmf, mean and the variance. OR B) Describe a situation where the exponential distribution can be used to model the time between arrivals of customers at a bank. Specify the parameter(s) involved and derive the probability density function for this scenario.	CR	2