Mid-West University

Examinations Management Office

End Semester Examination 2081

Bachelor level/ B. Sc. /3rd Semester — Full Marks: 60

Time: 3 hours — Pass Marks: 30

Subject: Probability distribution (STA435/STAT335)

Candidates are required to give answer in their own words as far as practicable. The figures in the margin indicate full marks.

Group A

Long answer questions **[4x6 = 24]**

1. Let a binomial variate X has parameter n and p. Find the probability that X =x for given X>0. Also find mean and variance of the distribution.
2. Discuss Chebyshev's inequality. Derive the law of large numbers from this inequality.
3. Explain the gamma distribution. Determine r^{th} moment about origin and then find the mean, variance, skewness and kurtosis of gamma distribution with parameter α.
4. The joint density function of two continuous random variable x and y is

$$f(x,y)=\begin{cases} k\,xy & ; \quad 0<x<y<5 \\ 0 & ; otherwise \end{cases}$$

   i) Find the value of constant k.
   ii) Find marginal probability density function of x and y.
   iii) Find conditional density function of each random variable for a given value of the other.
   iv) Check whether the two random variable x and y are independent or not.

OR

Define central F-variate and derive its distribution. Also mention its applications.

Group B

Short answer questions **[6x4=24]**

5. Define probability density function and probability distribution function for two variate case. Write down the properties of Bivariate distribution function.
6. If X and Y are independent gamma variates with parameters m and n respectively, show that the variable U=X+Y and V=$\frac{X}{X+Y}$ are independent and that U is a G(m+n) variate and V is β_1(m,n) variate.
7. Define convergence in probability and state its properties.
8. Fit a Poisson distribution truncated at X=0 to the following data with respect to the number of red blood corpuscles(X) per cell:

x	0	1	2	3	4	5
Number of cells f	142	156	69	27	5	1

   Also calculate the expected frequencies.

9. If X and Y are independently distributed chi-square variate with m and n degree of freedom respectively, show that U=X+Y and V=$\frac{X}{Y}$ are independently distributed.

OR

Let X be a nonnegative random variable with probability density function f(x) and λ be a real positive number(λ > 0) then prove that $P(x \geq \lambda) \leq \frac{E(x)}{\lambda}$.

10. If the joint probability density function of X and Y is,

$$f(x,y)\begin{cases} \frac{1}{8}(6-x-y) & ;0<x<2\ ,2<y<4 \\ 0 & ;otherwise \end{cases}$$

Find:

i. P(X+Y<3)

ii. $P(X<\frac{3}{2} / Y<\frac{5}{2})$

Group C

Very short answer questions (*any six*) **[6x2=12]**

11. a) Distinguish between truncated and non-truncated distribution.

b) What is the role of Jacobian of transformation?

c) What do you mean by degree of freedom?

d) Illustrate how conditional distributions are computed.

e) Define marginal probability mass function of X and Y.

f) Write down important applications of T distribution.

g) Define χ^2- distribution.

h) What are the applications of Markov inequalities?

The End