

Subject: Statistics

Course No and Title: STSC3422M/ Distributions and Convergence

Time: 2.15 hours      Max Marks:100      Min. Marks:40

Section A: Objective Type Questions

**Q1. Choose the appropriate Answer:** (8x1.5=12)

- i. If  $(d/dx) f(x)$  is  $g(x)$ , then the antiderivative of  $g(x)$  is  
A  $f(x)$       B  $F(x)$   
C  $g(x)$       D None of these
- ii.  $\int_0^2 x^2 dx =$   
A 2      B  $2/3$   
C  $8/3$       D None of these
- iii.  $\int_0^2 (x^2 + 3) dx$  equals  
A  $24/3$       B  $25/3$   
C  $26/3$       D None of these
- iv. Which theorem states that the larger the sample size, the closer the sample mean will be to the mean of the population?  
A Law of large means      B Basu's theorem  
C Law of Large numbers      D Fisher's theorem
- v. The law of large numbers shows a relationship between the theoretical probability and the...  
A Sample size      B Exponential probability  
C Experimental probability      D Rational probability
- vi. Standard normal distribution has which of the following properties:  
A Mean=variance=1      B Mean=variance=0  
C Mean=0, variance=1      D Mean= standard deviation
- vii. The shape of the Normal Curve is  
A flat      B Bell shaped  
C Circular      D None of these

- viii. Consider a set of 18 samples from a standard normal distribution. We square each sample and sum all the squares. The number of degrees of freedom for a Chi Square distribution will be?  
A 17      B 18  
C 19      D 20

Section-B: Descriptive Type Questions (Short Type)

**Q2: Answer all the Questions** (8 x 4 =32)

- i. Write the main application of differentiation?
- ii. State the product rule of differentiation?
- iii. Define Convergence in Probability?
- iv. Define Strong law of Large numbers?
- v. State the Central Limit Theorem?
- vi. Define standard normal variate?
- vii. Write down the main applications of Chi-square Distribution?
- viii. Write down the main assumptions of t distribution?

Section – C: Descriptive Type Questions (Medium Type)

**Answer all the questions:** (4 x 7=28)

- Q 3.** Differentiate the following functions?  
 $e^{-x} \log x$       2.  $e^{-ax} / \log x$

**OR**

Integrate the following functions?

1.  $e^{-9x} \log x$       2.  $e^{-x} / \log 3x$

- Q 4.** State and Prove Chebsheves Inequality?

**OR**

Discuss the concept of weak law of Large numbers?

- Q 5.** Define normal distribution. Write its properties?

**OR**

Define Beta distribution of 1<sup>st</sup> kind. Obtain its mean and variance.

**Q6.** Define chi-square distribution. Write its properties?

**OR**

Define t distribution. Write down the main properties of distribution?

**Section – D: Descriptive Type Questions (Long Type)**

**Answer any two of the following: (2 x 14=28)**

**Q7.** Integrate the following functions?

1.  $e^{-\tan x} \log x$       2.  $e^{-\cot x} / \log \sin x$

**Q8.** State and Prove Chebyshev's theorem on convergence?

**Q9.** Obtain its mean and variance of normal distribution through moment generating function?

**Q10.** Obtain its mean and variance of chi-square distribution?