



End Semester Examination

Instructions :

1. All questions are compulsory.
2. Scientific calculator is allowed.
3. † Some distribution table values:

- Standard Normal distribution : $\Phi(3.33) = 0.9996$, $\Phi(2.22) = 0.9868$.
- t distribution with degree of freedom 3: $t_{0.025} = 3.182$, $t_{0.05} = 2.353$.
- χ^2 distribution with degree of freedom 3: $\chi_{0.025}^2 = 9.21$, $\chi_{0.05}^2 = 7.81$.

† You can consider this as Hint for the some questions.

1. Give Proof of weak law of large numbers using chebyshev inequality. (5)
2. Is $\frac{1}{n} \sum_{i=1}^n (X_i - \bar{X})^2$ is biased estimator for sample Variance S^2 ? Prove. (5)
3. Estimate mean and variance for Gaussian Random variable using Maximum likelihood estimation (MLE). (7)
4. A coin is flipped a total of 200 times, in 4 batches of 50 flips each. The number of heads in each of the batches is as follows: (7)

24, 27, 22, 24

find the 95% confidence interval for probability of head.

5. An urn containing two black and three white balls. If 100 times, two balls are chosen from urn with a replacement. What is the probability that a black ball appears more than 100 times? (7)
6. In one experiment, person toss a coin till he get head but he toss it maximum 3 times.
 - (a) What is the probability that he not get head till 3 trials if coin is **fair**? (2)
 - (b) Person repeated an experiment 50 times. His observations after 50 times performing experiments are, (5)

Number of trials to get head	1	2	3	Not got head in 3 trials
Number of Experiments	22	13	8	7

At the 5% significance level, do these data provide significant evidence that the used coin is **fair**? Prove.

7. A certain part of a machine can be in two states: working or undergoing repair. A working part fails during the course of a day with a probability of 0.2. A part undergoing repair is put into working order during the course of a day with a probability of 0.8. If Monday a part went for repair then what is the probability that it is working on Thursday? (7)

Best wishes