Birla Institute of Technology & Science, Pilani

Second Semester 2019-2020, MATH F113 (Probability & Statistics)

Tutorial Sheet - 5 **Syllabus: Module 6 (Sec. 8.1-8.4: Hypothesis Testing)**

1. Students are encouraged to solve these problems by themselves before they actually attend the tutorial class.
2. During one-hour tutorial, do not expect that the tutorial instructor will provide the entire solution of a problem. Rather, you are supposed to clarify your doubts or verify your solution.

1. A random sample of 100 recorded deaths in India during the past one year showed an average life span of 71.6 years. Assuming a population standard deviation of 8.9 years, does this seem to indicate that the mean life span today is greater than 70 years? Use a 0.05 level of significance.
2. Given a random sample of 9 pints from different production lots, we want to test whether the fat content of a certain kind of ice-cream exceeds 25%. What can we conclude at the 0.05 level of significance about the hypothesis $\mu = 25\%$ if the sample has a mean $\bar{x} = 26\%$ and standard deviation $s = 0.5$?
3. A model of Saudi Arabia's oil export strategy has been devised based on interviews with informed economists. The model is to be used to estimate the mean number of barrels of oil produced per day by this country. The usefulness of the model is to be partially checked by comparing the predicted mean for the year 1980 to its known value for that year, namely 9.5 million barrels per day. Find the critical points for testing $H_0: \mu = 9.5$ vs $H_1: \mu \neq 9.5$ at the 0.005 level of significance based on a sample of 50 values. For the data collected, $\bar{x} = 9.8$ and $s = 1.2$. Test H_0 at $\alpha = 0.005$ level? Any assumption, if required, should be clearly stated.
4. A poll of investment analysts taken earlier suggests that a majority of these individuals think that the dominant issue affecting the future of the solar energy industry is falling energy prices. A new survey is being taken to see if this is still the case. Let *p* denote the proportion of investment analysts holding this opinion. Set up the appropriate null and alternative hypothesis. When the survey is conducted, 59 of the 100 analysts sampled agreed that the major issue is falling energy prices. Is this sufficient to allow us to reject H_0? Explain based on P-value of the test.
5. A fast-food chain has developed a new process to ensure that orders at the drive-through are filled correctly. The previous process filled orders correctly 85% of the time. Based on a sample of 100 orders using the new process, 94 were filled correctly. At the 0.01 level of significance, can you conclude that the new process has increased the proportion of orders filled correctly?
6. The St. Louis Metro Bus Company wants to promote an image of reliability by encouraging its drivers to maintain consistent schedules. As a standard policy, the company would like arrival times at bus stops to have a low variability. In terms of arrival times, the company standard specifies an arrival time variance of 4 or less (measured in minutes). The hypothesis $H_0: \sigma^2 = 4$ and $H_1: \sigma^2 > 4$ is formed to help the company determine whether arrival time population variance is excessive. A sample data of 24 bus arrivals show that the sample variance is 4.9. Test the hypothesis at $\alpha = 0.05$ level. Any assumption, if required, should be clearly stated.
7. Marks obtained in MATH F113 course follow a normal distribution. Students suspect that the instructor's claimed average of 57 marks is higher than the true average. To contest this claim, they collect marks of 15 randomly selected students and found $\sum_{1}^{15} x_i = 813$ and $\sum_{1}^{15} x_i^2 = 44200$, where x_i denote the mark of the i^{th} student. Formulate and test the hypothesis at 10% level of significance.

**********END**********