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**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**SCHOOL OF EDUCATION**

**UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF EDUCATION ARTS WITH IT**

**4th YEAR 1ST SEMESTER 2015/2016 ACADEMIC YEAR**

**KISII CAMPUS REGULAR**

**COURSE CODE: SMA 421**

**COURSE TITLE: TEST OF HYPOTHESIS**

**EXAM VENUE: STREAM: (BED ARTS)**

**DATE: EXAM SESSION:**

**TIME: 2 HOURS**

**Instructions:**

1. **Answer Question ONE (COMPULSORY) and ANY other 2 questions**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

**QUESTION ONE (30mks)**

1. i)Give two possible definitions of a hypothesis (2mks)

ii) Explain two types of hypothesis (4mks)

1. i)Two errors exist in any hypothesis testing. Explain them. (4mks)

ii) A random variable has a normal distribution with mean $μ$ and standard deviation 3.The null hypothesis $μ=20$ is to be tested against the alternative hypothesis $μ>20$ using a random sample of size 25. It is decided that the null hypothesis will be rejected if the sample mean is greater than 21.4. Calculate the level of significance of this test. (4mks)

1. Any experimental hypothesis must satisfy two important criteria. Explain the two. (4mks)
2. A single observation is taken from a Poisson distribution with mean $θ$ and used to test the hypothesis $θ=6$ against the alternative$θ>6$. The critical region is chosen to be $x\geq 11$.
3. At what significance level is the test carried out?
4. Find the power of the test if in fact $θ=8.5$ (8marks)

**QUESTION TWO (20mks)**

1. Boxes of certain masses are normally distributed with mean $μ$ and standard deviation 15 grams. A test of the null hypothesis $μ=375$grams against the alternative $μ>375$grams is carried out at 2.5% level using a random sample of 16 boxes.
2. Show that the alternative hypothesis is accepted when $\overbar{x }>382.35$grams where $\overbar{x}$ is the sample mean mass. (4marks)
3. Given that the actual value of $μ=385$grams, find the probability of making a type two error and the power of the test. (4marks)
4. i. State completely without proof the Neyman- Pearson Lemma ( 3marks)

ii.Let X1,…, Xn denote an independent random sample from a population with a poisson distribution with mean $λ$. Derive the most powerful test for testing

 H0:$ λ=2$ versus Ha : $λ=\frac{1}{2}$ (9mks)

**QUESTION THREE (20mks)**

1. Machine 1 produces 5% defectives, machine 2 produces 10% defectives. Ten items produced by each of the machines are sampled randomly. X=number of defectives. Let $θ$ be the true proportion of defectives.

Test H0 : $θ=0.05$ versus Ha :$θ=0.1$ use $α$ = 0.05 (12mks)

1. A random sample of size 49 is taken from the model $N(123.5, 49)$. The average value of the 49 sample points is found to be 125. Based on this value, one claims that the parent population mean is above the one stated in the model.
2. Test this claim at 1% level of significance.
3. What is the power of this test if in fact $μ=124$ (8marks)

**QUESTION FOUR (20mks)**

1. In terms of an observed value of a test statistics, define a P-value (2mks)
2. The management of a local health club claims that its mebers lose on the average 15pounds or more within the first 3months after joining the club. To check this claim, a consumer agency took a random sample of 45 members of this health club and found that they lost an average of 13.8 pounds within the first 3months of membership witha deviation of 4.2 pounds.
3. Find the P-value of this test (6mks)
4. Based on the P-value in (i) would you reject the null hypothesis at $α=0.01?$(2mks)
5. Explain five procedure followed for the likelihood ratio test(LRT)(10mks)

**QUESTION FIVE (20mks)**

1. i)A machine is considere to be unsatisfactory if it produces more that 8% defectieves. It is suspected that the machine is unsatisfactory. A random sample of 120 items produced by the machine contains 14 defectives. Does the sample evidence support the claim that the machine is unsatisfactory? Use $α=0.01$ (8mks)

ii)Give a clear definition of the Likelihood ratio $λ$ in the likelihood ratio test(2mks)

1. i)In a frequently travelled stretch of the 1-75 highway, where the posted speed is 70mph, it is thought that people travel on the average of atleast 75mph. To check this claim, the following radar measruements of the speeds ( in mph) is obtained for 10 vehicles travelling on this stretch of the interstate highway.

66,74,79,80,69,77,78,65,79,81

Does the data provide sufficienct evidence to indicate that the mean speed at which people travel on this stretch of highway is at least 75mph? Test the appropriate hypothesis using $α=0.01$ (8mks)

 ii)Two steps are involved in reporting test result as P-values,state them.(2mks)