NAME:

Student Number:

STAT 450 Final Examination

Richard Lockhart 15 December 2017

Instructions: This is an open book exam. You may use notes, books, a calculator and your computer to read my notes, the textbook or other books or notes on line. You *may* use sites like Wolfram alpha and software like Maple, Mathematica, and R but you may *not* make contact with other people. The exam is out of 45. You should have 12 pages, including this cover page. There are 9 questions. **DON'T PANIC**.

Marks

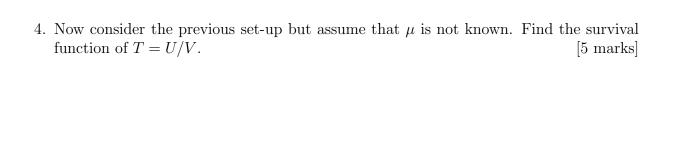
1	6	2	3
3	3	4	5
5	3	6	5
7	10	8	5
9	5		

Total		45
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1. Suppose U and V are independent exponentially distributed random variables. The mean of U is μ and the mean of V is $\phi\mu$. Suppose that the number μ_0 is known and find the simplest formula you can, with explicit constants, for testing $H_o: \mu = \mu_0, \phi = 1$ against the alternative $H_1: \mu = \mu_0, \phi = \phi_1$ for a specific $\phi_1 \neq 1$. [6 marks]

2. With the same set-up as the previous question is there a UMP test of $H_o: \mu = \mu_0, \phi = 1$ against $H_1: \mu = \mu_0, \phi > 1$? [3 marks]

3. With the same set-up as the previous question is there a UMP test of $H_o: \mu = \mu_0, \phi = 1$ against $H_1: \mu = \mu_0, \phi \neq 1$? [3 marks]



5. Now find the density of T.

[3 marks]

6. If your only data were T there would be a UMP test of $H_o: \phi = 1$ against $H_1: \phi > 1$. Find the simplest form for this test and give a formula for the corresponding P-value. [5 marks] 7. Now suppose that you have an sample of pairs (U_i, V_i) (each pair has the same joint distribution as in the previous parts. Find the log-likelihood, score function, Hessian, Fisher information matrix, and MLE of the parameters $(\mu \text{ and } \phi)$. [10 marks]

Extra Space for Question 7

8.	Give an approximate standard error for the estimate of ϕ . get a confidence interval for ϕ ?	How	would yo	ou use this to [5 marks]



Extra space