國立臺北商業技術學院101學年度研究所碩士班考試入學試題

准考證號碼：□□□□□□（請考生自行填寫）

財金財管.商研所.商務碩士班.資研所 筆試科目：統計學 共 4 頁，第 1 頁

注意事項	1. 本科目合計100分，答錯不倒扣。 2. 請於答案卷上依序作答，並標註清楚題號（含小題）。 3. 考完請將答案卷及試題一併繳回。

1. Find a such that the following function is a probability mass function.
$p(x) = ax^2e^{-4}4^x / x!, x = 0,1,2,3,.....$ (3 分)

2.

(a) Find b such that the following function is a probability density function.

$f(x) = b\sqrt{16-9x^2}, x \in [0, \frac{4}{3}]$ (3 分)

(b) Calculate $P(\frac{2}{3} \le X \le \frac{2\sqrt{3}}{3})$ (4 分)

3. The Rapid Test is used to determine whether someone has HIV (the virus that causes AIDS). The false-positive and false-negative rates are .03 and .080, respectively. A physician has just received the Rapid Test report that his patient tested positive. The physician assigned his patient to the low-risk group (defined on the basis of several variables) with only a 0.5% probability of having HIV. What is the probability that the patient actually has HIV? (5分)

Definition: A **false-positive** result is one in which the patient does not have the disease, but the test shows positive.

4. A factory's workers productivities are independently normally distributed. Worker 1 produces an average of 75 units per day with a standard deviation of 24. Worker 2 produces at an average rate of 60 per day with a standard deviation of 15. What is the probability that during 25 working days, worker 1 will outproduce worker 2 by 20%? (5 分)

5. Given the following two samples, test to determine whether the means of the two populations differ. (Use α=0.05)
Sample 1: 12 6 5 8 11 5 9 8
Sample 2: 7 11 13 5 8 7

$F_{5,7,0.025} = 5.29, F_{7,5,0.025} = 6.85, t_{12,0.025} = 2.179, t_{13,0.025} = 2.160, t_{14,0.025} = 2.145.$ (10 分)

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6.

(a) Show that the sample mean is relatively more efficient than the sample median when estimating the population mean. (5 分)

(b) Given the following information, determine the 95% confidence interval estimate of the population mean using the sample median. Sample median=500, n=50, $\sigma = 20$. (5 分)

7. Assume the logarithm of stock price at time t, S_t is normal distributed with mean $\ln 100 + 0.05t$ and variance 0.09t. In the other words, $\ln S_t - \ln 100 \sim N(0.05t, 0.09t)$. Find the mean and variance of the S_t. (10 分)

8. Four groups of salesmen were subjected to different sale techniques. The sale performances were measured at the end of a specified period of time.

Sample no. \ groups	1	2	3	4
1	65	69	59	80
2	69	72	62	88
3	73	75	67	89
4	79	79	76	94
5	81	81	78	
6	83	83	83	
7		90		

Do the data shown in table present sufficient evidence to indicate a difference in mean achievement for the four sale techniques? (assume the critical value of the statistic is 3.5) (15 分)

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9. The following table gives data on the CPI and AAA index of stock prices.

Variables / Year	CPI	AAA index
2002	74	101
2003	75	103
2004	78	105
2005	80	110
2006	82	118
2008	90	128
2009	96	119
2010	99	160
2011	103	161
2012	107	186

The summary statistics of this sample:

$$\sum_{t=2002}^{2012} CPI_t = 884 \text{ , } \sum_{t=2002}^{2012} AAA_t = 1{,}291 \text{ , } \sum_{t=2002}^{2012} CPI_t \cdot AAA_t = 117{,}134 \text{ ,}$$

$$\sum_{t=2002}^{2012} CPI_t^2 = 79{,}484 \text{ , } \sum_{t=2002}^{2012} AAA_t^2 = 174{,}521$$

Consider the following regression model: $AAA_t = \alpha + \beta \cdot CPI_t + \varepsilon_t$. Use the method of least squares to estimate above regression from the preceding data. Assuming all the full ideal condition are fulfilled, obtain

1) α and β ? (8 分)
2) standard errors of the these estimators ? (8 分)
3) ANOVA table for the regression ? (10 分)
4) R^2 ? (5 分)
5) What is the statistic for testing $H_0 : R^2 = 0$? (4 分)

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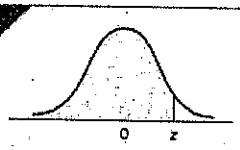
TABLE 3 (*Continued*)



$P(-\infty < Z < z)$.

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990

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