

國立臺灣科技大學  
九十三學年度碩士班考試試題

系所組別：自動化及控制研究所乙組  
科 目：統計學

1

總分 100 分, 共 7 題

- 請寫出這兩個子題的算式, 不必算出數值。
  - 由 30 雙 (60 隻) 鞋子中隨機抽取 20 隻鞋子。求算正好取出 5 雙鞋子的機率。(5%)
  - 碗公中有四顆骰子, 若投擲之後有兩顆骰子出現相同點數則另兩顆骰子的點數和即為比較勝負的依據。若四顆皆出現不同點數, 則必須再丟一遍。求算必須再丟一遍的機率?(5%)
- 潛艇在太平洋中失蹤。將太平洋區分成 4 個海域, 潛艇在任一個海域的可能性相同。若潛艇確實第 1 個海域但搜尋不到的機率為  $1/8$ 。
  - 求算在第 1 個海域搜尋不到的狀況下, 潛艇確實第 1 個海域的機率。(5%)
  - 求算在第 1 個海域搜尋不到的狀況下, 潛艇在第 2 個海域的機率。(5%)
- 一個生產線的不良率為  $p = 1/3$ 。假設產品之間互為獨立。今檢查了第 4 個產品發現了第二個不良品。令  $X$  表示發現第二個不良品所需的檢驗數。
  - 求算  $E(X)$ 。(5%)
  - 為判斷不良率是否仍然維持為  $1/3$ , 應計算  $P(X \geq 4|p = 1/3)$  或  $P(X \leq 4|p = 1/3)$ ? 為什麼?(5%)
  - 計算問題 (b) 中適當之機率。(5%)
  - 如何根據 (c) 中所算機率判斷不良率是否仍然維持為  $1/3$ ? 為什麼?(5%)
- Suppose  $\{X_1, X_2, \dots, X_n\}$  is a random sample drawn from  $N(\mu, \sigma^2 = 1^2)$ . Consider testing  $H_0 : \mu = 10$  against  $H_1 : \mu > 10$ . Let  $\alpha$  and  $\beta$  denote the type I and II error rates. Determine the minimum sample size  $n$  such that  $\alpha = 16\%$  and the power for  $\mu \geq 11.5$  is at least 97.5%.(10%)  
(Use  $P(Z > 2) = 2.5\%$  and  $P(Z > 1) = 16\%$ , where  $Z \sim N(0, 1)$ .)



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2

5. In the setup of a manufacturing process, a machine is either correctly or incorrectly adjusted. The probability of a correct adjustment is .90. When correctly adjusted, the machine operates with a 5% defective rate. However, if it is incorrectly adjusted, a 75% defective rate occurs.
- After the machine starts a production run, what is the probability that a defect is observed when one part is tested?(5%)
  - Suppose that the one part selected by an inspector is found to be defective. What is the probability that the machine is incorrectly adjusted? What action would you recommend?(5%)
  - Before your recommendation in part (b) above was followed, a second part is tested and found to be good. Using your revised probabilities from part (b) as the most recent prior probabilities, compute the revised probability of an incorrect adjustment given that the second part is good. What action would you recommend now?(5%)
6. A well-known bank credit card firm is interested in estimating the proportion of credit card holders that carry a nonzero balance at the end of the month and incur an interest charge. Assume that the desired precision for the proportion estimate is  $\pm 3\%$  at a 98% confidence level.
- How large a sample should be recommended if it is anticipated that roughly 70% of the firm's cardholders carry a nonzero balance at the end of the month?(7%)
  - How large a sample would be recommended if no planning value for the population proportion can be specified?(8%)
7. From the results of mileage testing, an automobile manufacturer claims that a new economy model will get at least 25 miles per gallon of gasoline.
- Using a .02 level of significance and a sample of 30 cars, what is the rejection rule based on the value of  $\bar{X}$  for the test to determine if the manufacturer's claim is supported? Assume that  $\sigma$  is 3 miles per gallon.(5%)
  - What is the probability of committing a Type II error if the actual mileage is 23 miles per gallon?(5%)
  - What is the probability of committing a Type II error if the actual mileage is 24 miles per gallon?(5%)
  - What is the probability of committing a Type II error if the actual mileage is 25.5 miles per gallon?(5%)



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3

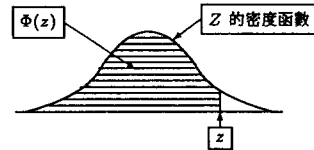


表 A.2 標準常態分布累積機率函數  $\Phi(z) = \int_{-\infty}^z \frac{1}{\sqrt{2\pi}} e^{-t^2/2} dt = P(Z \leq z)$

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

