

國立台灣科技大學九十五學年度碩士班招生試題

系所組別： 自動化及控制研究所碩士班乙組
 科 目： 統計學

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共六題，總計 100 分。依序作答。

- 石油鑽探公司每鑽一口井會發現石油的機率為 0.6。假設每次鑽探之間是「獨立」的。回答下列問題時，只需列出算式即可。
 - (7%) 求算鑽探 10 次發現 3 口井有石油的機率。
 - (8%) 求算鑽探少於 10 次就發現 3 口井有石油的機率。
- 假設每瓶「可口可樂」的瓶蓋內有英文字母 A, B, C, D 中的一個英文字母，而且不同英文字母的「可口可樂」在市場上各佔有 $1/4$ 的比例。今由市場中隨機買回 5 瓶「可口可樂」。若買回的 5 瓶中包含有 N 個不同英文字母。回答下列問題時，只需列出算式即可。
 - (10%) 求算平均數 $E(N)$ 。
 - (10%) 求算平均要買幾瓶才能集滿四個英文字母？
- 假設 $\{X_1, \dots, X_{25}\}$ 為一組抽自 $N(\mu, \sigma^2 = 2^2)$ 的「隨機樣本」，其中 μ 為未知。檢定 $H_0: \mu = 32$ 相對於 $H_1: \mu < 32$ 。「棄卻域」為

$$\left\{ (x_1, \dots, x_{25}) \mid \bar{x} = \sum_{i=1}^{25} x_i / 25 \leq 31.2 \right\}.$$

若 Z 具有標準常態分配，則 $P(|Z| < 1) = 68\%$, $P(|Z| < 2) = 95\%$ 。

- (7%) 求算「型 I 錯誤」機率 α 。
- (8%) 求算在 $\mu = 30.8$ 時的「檢定力」。



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4. (20%) $P(A) = 0.42$, $P(B|A) = 0.66$, and $P(B|\bar{A}) = 0.25$. Find the following:
 $P(\bar{A})$, $P(\bar{B}|A)$, $P(\bar{B}|\bar{A})$, $P(B)$, $P(A|B)$, $P(\bar{A}|B)$, $P(A|\bar{B})$, $P(\bar{A}|\bar{B})$.
5. (20%) In bottle production, bubbles that appear in the glass are considered defects. Any bottle that has more than two bubbles is classified as “nonconforming” and is sent to recycling. Suppose that a particular production line produces bottles with bubbles at a rate of 1.1 bubbles per bottle. Bubbles occur independently of one another.
- (a) Let p denote the probability that a randomly chosen bottle is nonconforming. Write down the detail equation representing p .
- (b) Bottles are packed in cases of 12. An inspector chooses one bottle from each case and examines it for defects. If it is nonconforming, she inspects the entire case, replacing nonconforming bottles with good ones. This process is called rectification. If the chosen bottle conforms (has two or fewer bubbles), then she passes the case. In total, 20 cases are produced. What is the probability that at least 18 of them pass (in terms of p)?
- (c) What is the expected number of nonconforming bottles in the 20 cases after they have been inspected and rectified using the scheme described in part (b) (in terms of p)?
- (d) Suppose there is another checking scheme in problem (b) as following. An inspector chooses “two” bottles from each case and examines them for defects. If any of them is nonconforming, she inspects the entire case, replacing nonconforming bottles with good ones. If none of the chosen bottles conforms (has two or fewer bubbles), then she passes the case. In total, 20 cases are produced. What is the probability that at least 18 of them pass (in terms of p)?
6. (10%) Mary is preparing for an interview of applying a graduate school. Before the interview, she evaluates her chance of getting acceptance at 50%. Then, on thinking about her friends who have interviewed and gotten acceptance from this school, she realizes that of the people who were accepted, 95% had good interviews. On the other hand, of those who weren't accepted, 75% said they had good interviews. If Mary has a good interview, what is her chance of being accepted?

