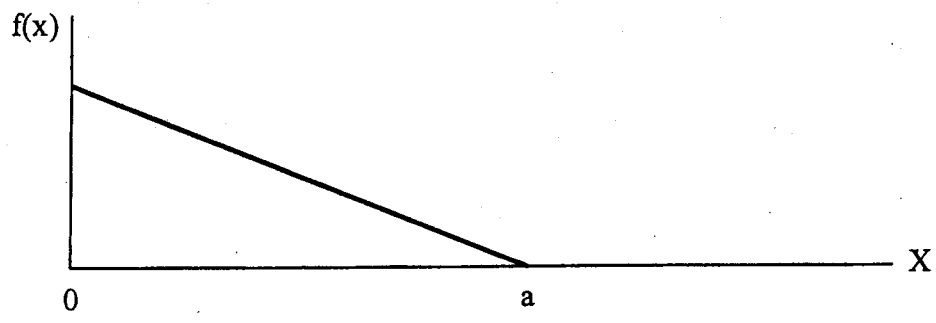


378  
374  
372

本試題是否可以使用計算機：可使用，不可使用（請命題老師勾選）

1. (6%) Explain why the coefficient of variation can be used to compare the variability of two variables that are measured by different units and have different means and different standard deviations.
2. Consider the expression  $\text{Cov}(aX, bY+c)$  for random variables  $X$  and  $Y$ , where  $a$ ,  $b$ , and  $c$  are constants.
  - (a) (3%) Show that  $\text{Cov}(aX, bY+c) = ab\text{Cov}(X, Y)$ .
  - (b) (6%) Give the geometric interpretation for the equality given in (a).
3. Let the probability density function of random variable  $X$  be defined as the figure given below.
  - (a) (3%) Write down the expression of  $f(x)$ .
  - (b) (6%) Calculate  $E(X)$  and  $\text{Var}(X)$ .
  - (c) (6%) Let a population follow this probability distribution. A sample  $\{x_1, x_2, \dots, x_{50}\}$  is retrieved by using the simple random sampling. What is the probability distribution of the sample mean  $\bar{x}$  and why?



4. (8%) In performing the hypothesis testing about two population proportions, explain why the test statistic is  $z = (\bar{p}_1 - \bar{p}_2) / \sqrt{\bar{p}(1-\bar{p})(\frac{1}{n_1} + \frac{1}{n_2})}$  when  $H_0: p_1 - p_2 \geq 0$ .
5. In performing the hypothesis testing about two population means  $\mu_1$  and  $\mu_2$ , let the null hypothesis  $H_0$  be  $\mu_1 - \mu_2 = 0$ . Suppose that both populations are normally distributed, and that population standard deviations  $\sigma_1$  and  $\sigma_2$  are known.
  - (a) (6%) When the samples for the two populations are independent, what is the test statistic and why?
  - (b) (6%) When the samples for the two populations are matched, what is the test statistic and why?

(背面仍有題目,請繼續作答)

本試題是否可以使用計算機： 可使用， 不可使用 (請命題老師勾選)

b. (20%) Please explain the following terms in detail and state the relationship for each pair:

- (a). Standardized Residual vs. Studentized Deleted Residual
- (b). Prior Distribution vs. Posterior Distribution
- (c). Binomial Population vs. Multinomial Population
- (d). Normal Distribution vs. Multinomial Distribution
- (e). Confidence Interval vs. Prediction Interval
- (f). Outlier vs. Influential Observation
- (g). Autocorrelation vs. Multicollinearity
- (h). Standard Deviation vs. Standard Error
- (i). Type Error vs. Type II Error
- (j). Comparisonwise Type I Error Rate vs. Experimentwise Type I Error Rate

7. (10%) Please State the usefulness of  $\chi^2$  test, i.e., under what kinds of situations, and for what objectives, will we use  $\chi^2$  test? Also, state the assumptions and testing processes in detail.

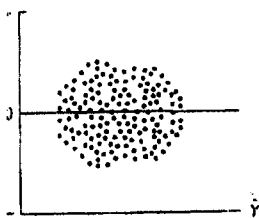
8. (5%) Please state the pros and cons for using non-parametric analysis?

9. (15%) After running a multiple regression analysis with five independent variables, the following ANOVA table is obtained

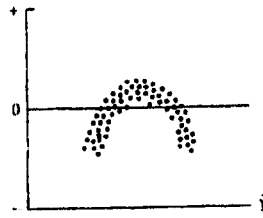
Source	d.f.	SS	MS	F
Regression				
Residual		224		
Total	45	270		

- (a). Please state the assumptions for the multiple regression analysis and how to examine them.
- (b). Please complete the above ANOVA table.
- (c). Calculate  $R^2=?$
- (d). How to test the hypothesis  $H_0: \beta_1=\beta_2=\beta_3=\beta_4=\beta_5=0$  when  $\alpha=0.05$ .
- (e). Suppose the following residual plots may be obtained from the residual analysis for the multiple linear regression, please state the possible causes and remedy strategies for each case:

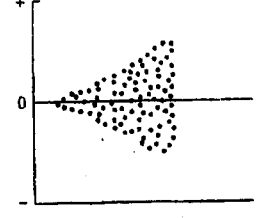
(i).



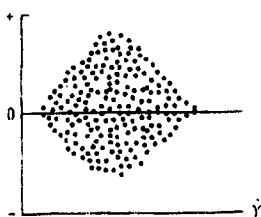
(ii).



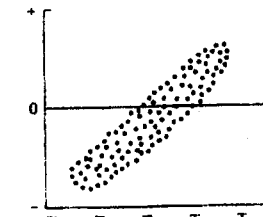
(iii).



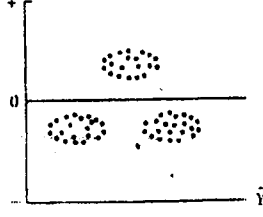
(iv).



(v).



(vi).



(vii).

