**PART I.** Multiple Choice Q 3 points each.
**INSTRUCTIONS** :You do iled steps (無需列出計算過程).

1. Which of the following i
   (a). If event A and B a d B are mutually exclusive
   (b). If event A and B a n A and B are not independent
   (c). If the covariance Y equals to zero, then X and Y must be independent.
   (d). The relationship b X and Y is that $Y = a + bX$, where $a$ and $b$ are c lation coefficient of X and Y must equal to 1.

2. Firm ABC is concerned by firm XYZ. Firm ABC estimates that the proba ng below its book value of $50 is 0.7. The probability of Z is 0.6. Given the stock price of ABC goes below 50, er attempt by XYZ is 0.8. What is the probability that XY r ABC, given that ABC stock does not drop below 50
   (a). 0.8667 (b). 0. 6

3. The probability density e X is given by
   $f(x) = 6x(1-x), 0 \le x \le$ f X is
   (a). 1/6. (b). 1/3. (

4. Random variable X den mers arriving at a bank. We also know that $E(X) = 100$ hebyshev's Inequality to find the upper bound on the pro customers is outside the range [75, 125], which is
   (a). 2/125. (b). 4/12 1/125.

5. The joint distribution ables X and Y is
   $f(x, y) = 2x, 0 \le x \le 1,$ iance of X and Y is
   (a). 1/6. (b). 1/3. (

6. Suppose we cut a horiz g, into two pieces randomly. Let X be the random variab ength of piece on left hand side. Correspondingly, 5-X is nt hand side. Find the expectation of the cross wo pieces, i.e., $E[X(5-X)]$ which is: (feet$^2$)
   (a). 5/2 (b). 25/2 (

7. There are 400 identical ently. The probability of failure on each machine is 0.0 riod. Use Poisson approximation to estima **re than one** machine are fail.
   (a). $e^{-8}$ (b). $1 - e^{-8}$

8. Suppose *X* follows an exponential distribution ($f(x)=\frac{1}{\mu}e^{-x/\mu},\ 0<x<\infty$), and $P(x\le 1)=P(x>1)$, then Var(*x*) is
(a). 2*ln*(2) (b). *ln*(2) (c). $e^{-4}$ (d). $e^{-2}$

9. Let $X_1, X_2, ...., X_n, X_{n+1}, ...., X_{m+n}$, be random samples from a population with distribution ~ $N(0,\sigma^2)$. Let $Y=\frac{\sqrt{m}\sum_{i=1}^{n}X_i}{\sqrt{n}\sqrt{\sum_{i=n+1}^{n+m}X_i^2}}$。Then *Y* has;
(a). a *t* distribution with degree of freedom *df*=*n*.
(b). a *t* distribution with degree of freedom *df*=*n*-1.
(c). a *t* distribution with degree of freedom *df*=*m*.
(d). a *t* distribution with degree of freedom *df*=*m*-1.

10. Let $X_1, X_2, ...., X_n, X_{n+1}, ...., X_{m+n}$, be random samples from a population with distribution ~ $N(0,\sigma^2)$. Let $Y=\frac{m\sum_{i=1}^{n}X_i^2}{n\sum_{i=n+1}^{n+m}X_i^2}$。Then; *Y* has
(a). a *F* distribution with degree of freedom $df_1=n-1,\quad df_2=m-1$
(b). a *F* distribution with degree of freedom $df_1=n,\quad df_2=m$
(c). a *F* distribution with degree of freedom $df_1=m-1,\quad df_2=n-1$
(d). a *F* distribution with degree of freedom $df_1=m,\quad df_2=n$

11. Survey the income from 25 persons and find their sample mean is 35 (thousand). Suppose its distribution is unknown but the population standard deviation of a person's income is known to be 6. Use Chebyshev inequality to construct its 96% confidence interval for average income, which is
(a). [32, 38] (b). [30, 40] (c). [29, 41] (d). [28, 42]

12. The *p.d.f.* of random variable *X* is $f(x)=\frac{1}{\mu}e^{-x/\mu}, 0<x<\infty$. To test the hypothesis $H_0:\mu=10$ *vs.* $H_a:\mu=20$. Let *X* >15 be the rejection region. Then, the probability of Type I error ($\alpha$) is
(a). $1-e^{-3/2}$ (b). $e^{-3/2}$ (c). $1-e^{-3/4}$ (d). $e^{-3/4}$

13. Following question 12, the testing power (1-$\beta$) is.
(a). $1-e^{-3/2}$ (b). $e^{-3/2}$ (c). $1-e^{-3/4}$ (d). $e^{-3/4}$

14. The *p.d.f.* of random variable *X* is $f(x)=(\alpha+1)x^{\alpha}, 0<x<1$. Then, the method of moment estimator (MOM) for parameter α is (Hint: let $E(X)=\bar{X}$):
(a). $\frac{1-2\bar{X}}{\bar{X}-1}$ (b). $\frac{2\bar{X}-1}{\bar{X}-1}$ (c). $\frac{\bar{X}-1}{2\bar{X}-1}$ (d). $\frac{1-\bar{X}}{2\bar{X}-1}$

15. Which of the [illegible]ing statements about the analysis of variance (ANOVA) is incorrect?
(a). Under t[illegible]sumption of common variance, mean square for error is an unbiased es[illegible]r for the variance
(b). Under t[illegible]sumption of common variance, mean square for treatment may not be an u[illegible]d estimator for the variance
(c). Using *t* [illegible]c to test the equivalence of paired treatment mean, given the significant l[illegible]nay increase the actual type I error.
(d). To test t[illegible]uivalence of treatment mean, using randomized block design is always m[illegible]owerful than completely randomized design.

16. Consider a r[illegible]e regression with two independent variables. If we find the correlation c[illegible]ent between the two independent variables approaches to one, then
(a). the vari[illegible]nflation factor will approach to zero
(b). the vari[illegible]nflation factor will approach to infinity
(c). the star[illegible]deviation of the slopes will approach zero
(d). the star[illegible]deviation of the slopes will approach infinity

17. Consider a s[illegible] regression with sample size *n*=40, you are told that $\sum y_i = 160$ , [illegible]$= 80$ and the Least Square estimate of $\beta_0$ (intercept) is 2, then $\beta_1$ (slope)= ?
(a). 1/2 ([illegible]) (c). 2 (d). 4

18. Which of the[illegible]ving is false? The Least Square estimator for regression
(a). is a line[illegible]nbination of observation *y*
(b) is consi[illegible]only if independent variables and error term are independent
(c) can not [illegible]rived if the independent variables are linearly dependent
(d) can not [illegible]rived when Gauss Markov assumptions do not hold

19. When fitting[illegible]gression model $Y = \alpha + \beta X + \varepsilon$ , you find that the error variance is proportic[illegible] $X^{-1/2}$ . Which of the following models can be used to correct the above f[illegible]f heteroskedasticity?
(a). $YX^{1/}$[illegible]$^{-1/4} + \beta X^{5/4} + \varepsilon^*$
(b). $YX^{1/}$[illegible]$\beta X^{5/4} + \varepsilon^*$
(c). $YX^{1/}$[illegible]$^{1/2} + \beta X^{3/2} + \varepsilon^*$
(d). $YX^{-}$[illegible]$X^{-1/4} + \beta X^{3/4} + \varepsilon^*$
(e). $YX^{-}$[illegible]$X^{-1/2} + \beta X^{1/2} + \varepsilon^*$

20. A financia[illegible]ager uses firm's operating profit income from previous year as the depenc[illegible]ariable and firm's leverage in the current year as the independe[illegible]able in a simple regression. Using 20 years of data, the manager e[illegible]es the model slope coefficient with the least square estimator $\hat{\beta}$ , but doe[illegible] take into account that the error term in the model exhibit to be first order [illegible]gressive with autocorrelation coefficient $\rho > 0$ . Which of the following s[illegible]ents is false?

(a). The $R^2$ probably gives an overly optimistic picture of the success of the regression.
(b). The estimator of the standard deviation of $\hat{\beta}$ is biased downward.
(c). The estimator $\hat{\beta}$ is inconsistent.
(d). The estimator $\hat{\beta}$ is inefficient.

**PART II.**

INSTRUCTIONS : There are three questions worth a total of 40 points in Part II. It is necessary to show the detail solution processes on your answer sheet. (必須詳列其計算過程，只寫答案不予計分)

1. Suppose that financial crisis occurs in accordance with the assumption of the Poisson probability distribution at a rate of 1 times per five years.
   (1). Fine the probability that at least twice financial crises during next decay.
   (2). Find the probability distribution of the time between now and the next earthquake. (16%)

2. Let $P$ be the probability of getting a head when a given coin is tossed. In order to test $H_0: p = 0.5$ vs. $H_1: p \neq 0.5$, a trail, tossing the coin 5 times, is conducted, and let $X$ be the number of head obtained. If a test rejects $H_0$ when $X = 0$ and $X = 5$, answer the following questions.
   (1) Find the probability of type I error
   (2) If $p = 0.6$, find the probability of type II error.
   (3) If $p = 0.6$, find the power of test.
   (4) If the trial obtains 4 head, find the p-value of this test. (16%)

3. An economist wishes to study the monthly trend in the Dow Jones Industrial Average (DJIA). Data collected over the past 40 months were used to fit the model, where y=monthly close of the DJIA and t=month (1,2,...,40). The regression results appear below:

   $\hat{y}_t = 28 + 0.15 y_{t-1}$　$R^2 = 0.66$　$MSE = 144$　$t_{\text{int}} = 1.72$　$t_{y_{t-1}} = 3.76$　$DW = 1.32$

   Conduct a test to determine if the residuals are positively correlated (you need to state hypotheses, level of significant, decision rules,.....etc) (8%)

附表 3. Table of normal distribution

**Z Table**

Entries in the body of the table represents areas under the curve between −∞ and z

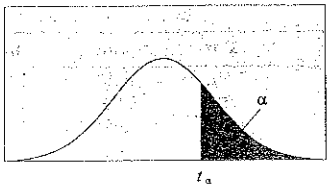
| z | 0.00 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.5000 | 0.5040 | 0.5080 | 0.5120 | 0.5160 | 0.5199 | 0.5239 | 0.5279 | 0.5319 | 0.5359 |
| 0.1 | 0.5398 | 0.5438 | 0.5478 | 0.5517 | 0.5557 | 0.5596 | 0.5636 | 0.5675 | 0.5714 | 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 |

附表 1. Durbin-Watson critical values

| Observations | | X variables, excluding the intercept 1 | | 2 | | 3 | | 4 | | 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| N | Prob. | D-L | D-U | D-L | D-U | D-L | D-U | D-L | D-U | D-L | D-U |
| 15 | 0.05 | 1.08 | 1.36 | 0.95 | 1.54 | 0.82 | 1.75 | 0.69 | 1.97 | 0.56 | 2.21 |
| | 0.01 | 0.81 | 1.07 | 0.7 | 1.25 | 0.59 | 1.46 | 0.49 | 1.70 | 0.39 | 1.96 |
| 20 | 0.05 | 1.20 | 1.41 | 1.10 | 1.54 | 1.00 | 1.68 | 0.90 | 1.83 | 0.79 | 1.99 |
| | 0.01 | 0.95 | 1.15 | 0.86 | 1.27 | 0.77 | 1.41 | 0.68 | 1.57 | 0.60 | 1.74 |
| 25 | 0.05 | 1.29 | 1.45 | 1.21 | 1.55 | 1.12 | 1.66 | 1.04 | 1.77 | 0.95 | 1.89 |
| | 0.01 | 1.05 | 1.21 | 0.98 | 1.30 | 0.90 | 1.41 | 0.83 | 1.52 | 0.75 | 1.65 |
| 30 | 0.05 | 1.35 | 1.49 | 1.28 | 1.57 | 1.21 | 1.65 | 1.14 | 1.74 | 1.07 | 1.83 |
| | 0.01 | 1.13 | 1.26 | 1.07 | 1.34 | 1.01 | 1.42 | 0.94 | 1.51 | 0.88 | 1.61 |
| 40 | 0.05 | 1.44 | 1.54 | 1.39 | 1.60 | 1.34 | 1.66 | 1.39 | 1.72 | 1.23 | 1.79 |
| | 0.01 | 1.25 | 1.34 | 1.20 | 1.40 | 1.15 | 1.46 | 1.10 | 1.52 | 1.05 | 1.58 |
| 50 | 0.05 | 1.50 | 1.59 | 1.46 | 1.63 | 1.42 | 1.67 | 1.38 | 1.72 | 1.34 | 1.77 |
| | 0.01 | 1.32 | 1.40 | 1.28 | 1.45 | 1.24 | 1.49 | 1.20 | 1.54 | 1.16 | 1.59 |
| 60 | 0.05 | 1.55 | 1.62 | 1.51 | 1.65 | 1.48 | 1.69 | 1.44 | 1.73 | 1.41 | 1.77 |
| | 0.01 | 1.38 | 1.45 | 1.35 | 1.48 | 1.32 | 1.52 | 1.28 | 1.56 | 1.25 | 1.60 |
| 80 | 0.05 | 1.61 | 1.66 | 1.59 | 1.69 | 1.56 | 1.72 | 1.53 | 1.74 | 1.51 | 1.77 |
| | 0.01 | 1.47 | 1.52 | 1.44 | 1.54 | 1.42 | 1.57 | 1.39 | 1.60 | 1.36 | 1.62 |
| 100 | 0.05 | 1.65 | 1.69 | 1.63 | 1.72 | 1.61 | 1.74 | 1.59 | 1.76 | 1.57 | 1.78 |
| | 0.01 | 1.52 | 1.56 | 1.50 | 1.58 | 1.48 | 1.60 | 1.46 | 1.63 | 1.44 | 1.65 |

附表 2. t-Table　$t$ 分配臨界值表

$$P(t > t_\alpha) = \alpha$$




| *d.f.* | $t_{.100}$ | $t_{.050}$ | $t_{.025}$ | $t_{.010}$ | $t_{.005}$ | *d.f.* |
|---|---|---|---|---|---|---|
| 1 | 3.078 | 6.314 | 12.706 | 31.821 | 63.656 | 1 |
| 2 | 1.886 | 2.920 | 4.303 | 6.965 | 9.925 | 2 |
| 3 | 1.638 | 2.353 | 3.182 | 4.541 | 5.841 | 3 |
| 4 | 1.533 | 2.132 | 2.776 | 3.747 | 4.604 | 4 |
| 5 | 1.476 | 2.015 | 2.571 | 3.365 | 4.032 | 5 |
| 6 | 1.440 | 1.943 | 2.447 | 3.143 | 3.707 | 6 |
| 7 | 1.415 | 1.895 | 2.365 | 2.998 | 3.499 | 7 |
| 8 | 1.397 | 1.860 | 2.306 | 2.896 | 3.355 | 8 |
| 9 | 1.383 | 1.833 | 2.262 | 2.821 | 3.250 | 9 |
| 10 | 1.372 | 1.812 | 2.228 | 2.764 | 3.169 | 10 |
| 11 | 1.363 | 1.796 | 2.201 | 2.718 | 3.106 | 11 |
| 12 | 1.356 | 1.782 | 2.179 | 2.681 | 3.055 | 12 |
| 13 | 1.350 | 1.771 | 2.160 | 2.650 | 3.012 | 13 |
| 14 | 1.345 | 1.761 | 2.145 | 2.624 | 2.977 | 14 |
| 15 | 1.341 | 1.753 | 2.131 | 2.602 | 2.947 | 15 |
| 16 | 1.337 | 1.746 | 2.120 | 2.583 | 2.921 | 16 |
| 17 | 1.333 | 1.740 | 2.110 | 2.567 | 2.898 | 17 |
| 18 | 1.330 | 1.734 | 2.101 | 2.552 | 2.878 | 18 |
| 19 | 1.328 | 1.729 | 2.093 | 2.539 | 2.861 | 19 |
| 20 | 1.325 | 1.725 | 2.086 | 2.528 | 2.845 | 20 |
| 21 | 1.323 | 1.721 | 2.080 | 2.518 | 2.831 | 21 |
| 22 | 1.321 | 1.717 | 2.074 | 2.508 | 2.819 | 22 |
| 23 | 1.319 | 1.714 | 2.069 | 2.500 | 2.807 | 23 |
| 24 | 1.318 | 1.711 | 2.064 | 2.492 | 2.797 | 24 |
| 25 | 1.316 | 1.708 | 2.060 | 2.485 | 2.787 | 25 |
| 26 | 1.315 | 1.706 | 2.056 | 2.479 | 2.779 | 26 |
| 27 | 1.314 | 1.703 | 2.052 | 2.473 | 2.771 | 27 |
| 28 | 1.313 | 1.701 | 2.048 | 2.467 | 2.763 | 28 |
| 29 | 1.311 | 1.699 | 2.045 | 2.462 | 2.756 | 29 |
| 30 | 1.310 | 1.697 | 2.042 | 2.457 | 2.750 | 30 |
| 31 | 1.310 | 1.696 | 2.040 | 2.453 | 2.774 | 31 |
| 32 | 1.309 | 1.694 | 2.037 | 2.449 | 2.739 | 32 |
| 33 | 1.308 | 1.692 | 2.035 | 2.445 | 2.733 | 33 |
| 34 | 1.307 | 1.691 | 2.032 | 2.441 | 2.728 | 34 |
| 35 | 1.306 | 1.690 | 2.030 | 2.438 | 2.724 | 35 |
| 36 | 1.306 | 1.688 | 2.028 | 2.435 | 2.720 | 36 |
| 37 | 1.305 | 1.687 | 2.026 | 2.431 | 2.715 | 37 |
| 38 | 1.304 | 1.686 | 2.024 | 2.429 | 2.712 | 38 |
| 39 | 1.304 | 1.685 | 2.023 | 2.426 | 2.708 | 39 |
| 40 | 1.303 | 1.684 | 2.021 | 2.423 | 2.705 | 40 |