國立中央大學99學年度碩士班考試入學試題卷

所別：營建管理研究所碩士班 不分組(一般生)　科目：工程經濟與統計　共 2 頁 第 1 頁

本科考試禁用計算器

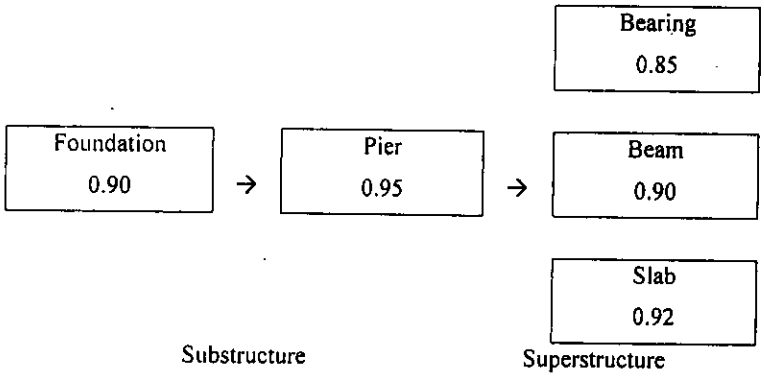
＊請在試卷答案卷（卡）內作答

I.工程統計（五十分）

一、 Basic concept questions：（每題 3 分，共 15 分）

1. 中央限制理論(Central Limit Theory)與下列何者有關？(a)CPM (b)WBS (c)PERT (d)EV (e)以上皆非。
2. 標準差 σ 如何影響常態分佈之形狀? (a)σ 愈大，形狀愈扁平 (b)σ 愈大，形狀愈往左偏斜 (c)σ 愈大，形狀愈往右偏斜 (d)σ 愈大，形狀愈高聳 (e)σ 愈大，形狀愈不規則。
3. Which of the following statement of σ and $\sigma_{x\ bar}$ is correct? (a)$\sigma \geq \sigma_{x\ bar}$ (b)$\sigma \leq \sigma_{x\ bar}$ (c)$\sigma = \sigma_{x\ bar}$ (d)$\sigma > \sigma_{x\ bar}$ (e)irrelevant。
4. Which of the following is NOT a sampling strategy? (a)error sampling (b) simple random sampling (c)systematic sampling (d)stratified random sampling (e)None of above。
5. 某預拌廠想知道混凝土強度與運送距離有無異常關聯，可利用下列何種圖？(a)網圖 (b)管制圖 (c)直方圖 (d)散佈圖 (e)藏寶圖。

二、 The reliability of different bridge components are shown as follows:（共 10 分）



1. What is the reliability of substructure (Foundation, Pier)? (3 分)
2. What is the reliability of superstructure (Bearing, Beam and Slab)? (4 分)
3. What is the reliability of the whole bridge? (3 分)

三、 A highway tunnel is under construction using the D&B (Drill and Blast) method. The total length of the tunnel is 180m. The progressing cycle is set to be 1.5 m. So far, 20 progressing cycles have been completed. Their respective cycle times are listed in the table below.（共 13 分）

Unit: hour

10.8	10.2	9.8	11.4
10.6	8.6	10.6	9.2
11.8	11.4	45.5	10.2
34.0	11.6	10.2	12.8
10.2	12.0	10.4	11.2

1. Calculate the Mean, Mode, Median and Standard deviation of the cycle time. (8 分)
2. With 95% confidence interval, approximately how much more time is needed to complete the work? (5 分)

四、 假設檢定的流程步驟為何？(4 分) 說明雙尾、左尾及右尾檢定的差異，並各舉一個營建工程例子說明其適用時機 (8 分) 。

參考用

注意：背面有試題

II. 工程經濟 (50 分)

Recently global economics have triggered inflation for numerous raw materials and other necessities. An analyst needs to seriously consider inflation before selecting a better alternative. According to his calculation, the general price inflation rates (f) for the next 5 years are 2.8%, 2%, 1.5%, 0.75%, and 2.2%; the total price escalation rates (e) for the next 5 years are 4.86%, 5.06%, 5.56%, 5.79%, and 8.33%; no salvage value is available for all alternatives; and the minimum attractive rate of return (MARR) after tax (i_c) is expected to be 8%. Given the detailed information for the independent and irreplaceable alternatives shown in the following table, please answer the questions:

Alternative	Cashflows (actual dollars)						Useful life
	Capital investment	Net cashflows					
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	
A	-200	50	50	50	50	50	5 years
B	-300	100	90	80	70		4 years

(a) For the next 5 years, determine the real interest rates (i_r) (10 pt) and the differential price inflation rates (e') (10 pt).
(b) To compare these two alternatives what assumption must be made under computation in real dollar (5 pt)? Which alternative is better based on real dollar computation (10 pt)?
(c) The analyst faces some uncertainty due to market changes. To deal with uncertainty in computation, what adjustments can he make for the better project? Please list 3 different methods and briefly explain them (15 pt).

** To find Present value given Future value (P/F) at the first 5 years, discount rate:

	i=2%	i=3%	i=4%	i=5%	i=6%	i=7%	i=8%	i=10%	i=12%	i=15%
Year 1	.9804	.9709	.9615	.9524	.9434	.9346	.9259	.9091	.8929	.8696
Year 2	.9612	.9426	.9426	.9070	.8900	.8734	.8573	.8264	.7972	.7561
Year 3	.9423	.9151	.8890	.8638	.8396	.8163	.7938	.7513	.7118	.6575
Year 4	.9238	.8885	.8548	.8227	.7921	.7629	.7350	.6830	.6355	.5718
Year 5	.9057	.8626	.8219	.7835	.7473	.7130	.6806	.6209	.5674	.4972

** To find Present value given Annuity (P/A) at the first 5 years discount rate:

	i=2%	i=3%	i=4%	i=5%	i=6%	i=7%	i=8%	i=10%	i=12%	i=15%
Year 1	.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9091	0.8929	0.8696
Year 2	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7355	1.6901	1.6257
Year 3	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.4869	2.4018	2.2832
Year 4	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.1699	3.0373	2.8550
Year 5	4.7135	4.5797	1.4518	4.3295	4.2124	4.1002	3.9927	3.7908	3.6048	3.3522

參考用

注意:背面有試題