國立中央大學107學年度碩士班考試入學試題

所別： 營建管理研究所 碩士班 不分組(一般生)　　共2頁 第1頁

科目： 工程經濟與統計

本科考試可使用計算器，廠牌、功能不拘　　＊請在答案卷(卡)內作答

I. 工程統計（50分）

一、一個營建專案所抽取的混凝土試體抗壓強度分布，大致是平均值為249.15 kgf/cm^2、標準差為27.22 kgf/cm^{2}的常態分布，請回答下列問題(每小題5分，共15分)

1. 有多少百分比的抗壓試體強度高於303.59 kgf/cm^2？
2. 最中間95%的抗壓試體，強度會介於哪兩個強度值之間？
3. 強度不到221.93 kgf/cm^{2}的抗壓試體佔多少百分比？

二、一家營造公司正在評估是否在一個執行中的專案購置一項新的工程設備，該設備的購置成本為兩百萬元，若購置該設備且於專案中使用該設備，有65%的機會該設備得以正常運作，使工作順利完成，但也有35%的機會該設備無法達成預期的效果，並帶來額外一百廿萬元的損失；若不購置該設備而採用舊有設備執行工作，則有 30%的機會能夠順利完成工作，卻也有 70%的機會舊有設備無法應付工程可能發生的問題，進而導致四百五十萬元的損失。(成本單位皆為新台幣)(共15分)

1. 請根據上述資訊繪製決策樹圖，並計算每一決策的成本期望值。(10分)
2. 根據分析結果，請問該公司應選擇何種決策？(5分)

三、一項針對全國公共工程專案目標的調查，訪問了全國1,025位有25年以上工作經驗的工程專案經理，樣本中有482位表示「零職災事故」為其最重要的專案目標。(共20分)

1. 本題中的參數p是什麼，請用文字說明？(10分)
2. 利用前述之調查結果，找出p的95%信賴區間。(5分)
3. 請說明前一小題所求得信賴區間結果之意義。(5分)

參考用

注意:背面有試題

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II. 工程經濟 (50 分)

You have been asked to provide suggestions regarding engineering economy. The following information you may need to carry out your work: (1) the corporate tax is at 17%; (2) the interest rate for its short term loan is at 7%; (3) the interest rate for its bond is at 10%; (4) the investors demand for 12% of return from its stock; (5) the corporate capital structure consists of $500 million for short term loan, $500 million for bond, $1500 million for stock, and $500 million for retained earnings. **Please answer the following questions.**

(a) Determine the after-tax cost of each element in the corporate capital structure (10 pt)? According to the weighted average concept, determine the Minimum Attractive Rate of Return (MARR) for the company (10 pt).

(b) Based on results from (a), if the company wants to raise funds of $1350 million and considers its lowest cost of capital, which element is the best choice for fund raising (5 pt)? Does this fund raising affect MARR yielded at (a)? If yes, state your adjusted MARR. If no, describe your explanations (5 pt).

(c) Assuming that the cost of capital for beginning of year market value is ignored, by referring to the result from (b) and using the minimum Equivalent Uniform Annual Cost (EUAC) method, carry out a replacement analysis for the equipment shown in the Table 1 (15 pt). When is the best time to replace the current equipment (5 pt)?

Table1: Cash flows for current and new equipment

Equipment	(in million dollars)	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Current							
	Market Value	$10	$7	$4	$3	$1	$0
	Annual Cost		$10	$12	$15	$18	$20
New							
	Market Value	$40	$30	$22	$15	$12	$10
	Annual Cost		$6	$7	$8	$9	$10

**To find Present value given Future value (P/F) at the first 15 period discount rate:

	i=5%	*i=6%*	*i=7%*	*i=8%*	*i=10%*	*i=12%*	*i=15%*
Period 1	.9524	.9434	.9346	.9259	.9091	.8929	.8696
Period 2	.9070	.8900	.8734	.8573	.8264	.7972	.7561
Period 3	.8638	.8396	.8163	.7938	.7513	.7118	.6575
Period 4	.8227	.7921	.7629	.7350	.6830	.6355	.5718
Period 5	.7835	.7473	.7130	.6806	.6209	.5674	.4972
Period 6	.7462	.7050	.6663	.6302	.5645	.5066	.4323
Period 7	.7107	.6651	.6227	.5835	.5132	.4523	.3759
Period 8	.6768	.6274	.5820	.5403	.4665	.4039	.3269
Period 9	.6446	.5919	.5439	.5002	.4241	.3606	.2843
Period 10	.6139	.5584	.5083	.4632	.3855	.3220	.2472
Period 11	.5847	.5268	.4751	.4289	.3505	.2875	.2149
Period 12	.5568	.4970	.4440	.3971	.3186	.2567	.1869
Period 13	.5303	.4688	.4150	.3677	.2897	.2292	.1625
Period 14	.5051	.4423	.3878	.3405	.2633	.2046	.1413
Period 15	.4810	.4173	.3624	.3152	.2394	.1827	.1229

**To find Present value given Annuity (P/A) at the first 15 period discount rate:

	i=5%	*i=6%*	*i=7%*	*i=8%*	*i=10%*	*i=12%*	*i=15%*
Period 1	0.9524	0.9434	0.9346	0.9259	0.9091	0.8929	0.8696
Period 2	1.8594	1.8334	1.8080	1.7833	1.7355	1.6901	1.6257
Period 3	2.7232	2.6730	2.6243	2.5771	2.4869	2.4018	2.2832
Period 4	3.5460	3.4651	3.3872	3.3121	3.1699	3.0373	2.8550
Period 5	4.3295	4.2124	4.1002	3.9927	3.7908	3.6048	3.3522
Period 6	5.0757	4.9173	4.7665	4.6229	4.3553	4.1114	3.7845
Period 7	5.7864	5.5824	5.3893	5.2064	4.8684	4.5638	4.1604
Period 8	6.4632	6.2098	5.9713	5.7466	5.3349	4.9676	4.4837
Period 9	7.1078	6.8017	6.5152	6.2469	5.7590	5.3282	4.7716
Period 10	7.7217	7.3601	7.0236	6.7101	6.1446	5.6502	5.1088
Period 11	8.3064	7.8869	7.4987	7.1390	6.4951	5.9377	5.2337
Period 12	8.8633	8.3836	7.9427	7.5361	6.8137	6.1944	5.4206
Period 13	9.3936	8.8527	8.3577	7.9038	7.1034	6.4235	5.5831
Period 14	9.8986	9.2950	8.7455	8.2442	7.3667	6.6282	5.7245
Period 15	10.3797	9.7122	9.1079	8.5595	7.6061	6.8109	5.8474

參考用

注意:背面有試題