國立彰化師範大學104學年度碩士班招生考試試題

系所：企業管理學系、
企業管理學系行銷與流通管理碩士班　選考丙　科目：統計學

☆☆請在答案紙上作答☆☆　

I. Multiple Choices (60%,each counts 3%)

1. From a group of six people, two individuals are to be selected at random. How many possible selections are there?
   (A) 12　(B) 36
   (C) 15　(D) 8

2. Which of the following statements is(are) always true?
   (A) $-1 \leqq P(E_i) \leqq 1$　(B) $P(A)=1 - P(A^c)$
   (C) $P(A) + P(B)=1$　(D) $\Sigma P_i>1$

3. On a December day, the probability of snow is .30. The probability of a "cold" day is .50. The probability of snow and "cold" weather is .15. Are snow and "cold" weather independent events?
   (A) only if given that it snowed　(B) no
   (C) yes　(D) only when they are also mutually exclusive

4. The life expectancy of a particular brand of tire is normally distributed with a mean of 40,000 and a standard deviation of 5,000 miles. What is the probability that a randomly selected tire will have a life of at least 30,000 miles?
   (A) 0.4772　(B) 0.9772
   (C) 0.0228　(D) 0.5000

5. If X and Y are any random variables with E(X) = 5, E(Y) = 6, E(XY) = 21, V(X) = 9 and V(Y) = 10, then the relationship between X and Y is a:
   (A) strong positive relationship　(B) strong negative relationship
   (C) weak positive relationship　(D) weak negative relationship

6. The exponential density function f(x):
   (A) is bell-shaped.　(B) is symmetrical.
   (C) approaches infinity as x approaches zero.　(D) approaches zero as x approaches infinity.

7. The number of parameters for an F distribution is:
   (A) 1　(B) 2
   (C) 0　(D) None of these choices.

8. A *posterior* probability value is a *prior* probability value that has been:
   (A) modified on the basis of new information.　(B) multiplied by a conditional probability value.
   (C) divided by a conditional probability value.　(D) added to a conditional probability value.

9. Suppose X = the number of cars owned by a family in the U.S. The probability distribution of X is shown in the table below.

X	0	1	2	3
Probability	0.56	0.23	0.12	0.09

What is the chance that a family owns more than one car?

(A) 0.23　(B) 0.21

(C) 0.44　(D) None of these choices.

10. Suppose you choose two families at random. What is the chance that they each own one car? (That means family A owns a car and family B owns a car.)

(A) 0.23　(B) 0.23 + 0.23 = 0.46

(C) 0.23 + 0.23-(0.23)*(0.23) =0.4071　(D) (0.23)*(0.23) = 0.0529

11. The hypothesis of most interest to the researcher is:

(A) both hypotheses are of equal interest.　(B) the null hypothesis.

(C) the alternative hypothesis.　(D) neither hypothesis is of interest.

12. In testing the hypothesis H_0: $\mu = 100$ vs. H_1: $\mu > 100$, the *p*-value is found to be 0.074, and the sample mean is 105. Which of the following statements is true?

(A) The probability of observing a sample mean at least as large as 105 from a population whose mean is 100 is 0.074.

(B) The probability of observing a sample mean smaller than 105 from a population whose mean is 100 is 0.074.

(C) The probability that the population mean is larger than 100 is 0.074.

(D) None of these choices.

13. Statistical methods that require, among other assumptions, that the populations be normally distributed are known as:

(A) distribution-free techniques.　(B) nonparametric techniques.

(C) parametric techniques.　(D) both (A) and (B) are correct.

14. In constructing a confidence interval estimate for the difference between two population proportions, we:

(A) pool the population proportions when the populations are normally distributed.

(B) pool the population proportions when the population means are equal.

(C) pool the population proportions when they are equal.

(D) never pool the population proportions.

15. Which of the following is not a required condition for one-way ANOVA?
(A) The sample sizes must be equal.
(B) The populations must all be normally distributed.
(C) The population variances must be equal.
(D) The samples for each treatment must be selected randomly and independently.

16. In regression analysis, the residuals represent the:
(A) difference between the actual x values and their predicted values.
(B) difference between the actual y values and their predicted values.
(C) square root of the slope of the regression line.
(D) change in y per unit change in x.

17. The coefficient of correlation is used to determine:
(A) the predicted value of y for a given value of x.
(B) the least squares estimates of the regression parameters.
(C) the strength and direction of the linear relationship between x and y.
(D) all of these choices.

18. Suppose the value of your chi-squared test statistic in a goodness-of-fit test is equal to 0. What do you conclude?
(A) Reject H_0. Conclude that at least one proportion is not equal to its specified value.
(B) Fail to reject H_0. Not enough evidence to say the proportions are different from what is listed in H_0.
(C) Not enough information; need the degrees of freedom for the test.
(D) None of these choices.

19. Which of the following statements regarding multicollinearity is not true?
(A) It exists in virtually all multiple regression models.
(B) It is also called collinearity and intercorrelation.
(C) It is a condition that exists when the independent variables are highly correlated with the dependent variable.
(D) All of these choices are true.

20. The power of a test is measured by its capability of:
(A) rejecting a null hypothesis that is false.
(B) not rejecting a null hypothesis that is false.
(C) rejecting a null hypothesis that is true.
(D) not rejecting a null hypothesis that is true.

II.Short Answers (40%)

1. In recent years the irradiation of food to reduce bacteria and preserve the food longer has become more common. A company that performs this service has developed four different methods of irradiating food. To determine which is best, it conducts an experiment where different foods are irradiated and the bacteria count is measured. As part of the experiment the following foods are irradiated: meat, poultry, veal, tuna, and yogurt. The results are shown below.(10%)

Bacteria Count

Food	Method 1	Method 2	Method 3	Method 4
Meat	47	53	36	68
Poultry	53	61	48	75
Veal	68	85	55	45
Tuna	25	24	20	27
Yogurt	44	48	38	46

(1) Set up the ANOVA Table. Use $\alpha = 0.01$ to determine the critical values.

(2) Can the company infer at the 1% significance level that differences in the bacteria count exist among the four irradiation methods?

2. A statistics professor investigated some of the factors that affect an individual student's final grade in her course. She proposed the multiple regression model $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \varepsilon$, where y is the final grade (out of 100 points), x_1 is the number of lectures skipped, x_2 is the number of late assignments, and x_3 is the midterm exam score (out of 100). The professor recorded the data for 50 randomly selected students. The computer output is shown below.(10%)

Regress Analysis Result

Predictor	Coef	StDev	T
Constant	41.6	17.8	2.337
x_1	3.18	1.66	1.916
x_2	1.17	1.13	1.035
x_3	0.63	0.13	4.846

$R^2 = 30.0\%$

ANOVA Table

Source of Variation	df	SS	MS	F
Regression	3	3716	1238.667	6.558
Error	46	8688	188.870	
Total	49	12404		

(1)Does this data provide enough evidence to conclude at the 5% significance level that the model is useful in predicting the final grade?

(2)Does this data provide enough evidence at the 5% significance level to conclude that the final grade and the number of late assignments are negatively linearly related?

(3)Interpret the coefficient b_3.

(4)What is the coefficient of determination? What does this statistic tell you?

3. A temporary worker productivity is normally distributed. One worker produces an average of 84 units per day with a standard deviation of 24. Another worker produces at an average rate of 74 per day with a standard deviation of 25.(10%)

(1) What is the probability that in any single day worker 1 will outproduce worker 2?

(2) What is the probability that during one week (5 working days), worker 1 will outproduce worker 2 on average?

4. A DVD rental store wants to know what proportion of its customers are under age 21. A simple random sample of 500 customers was taken, and 375 of them were under age 21. Presume that the true population proportion of customers under age 21 is 0.68. (10%)

(1) Find the mean and standard deviation of $\hat{p}$.

(2) What is the probability that the sample proportion is within 0.03 of the true proportion of customers who are under age 21?

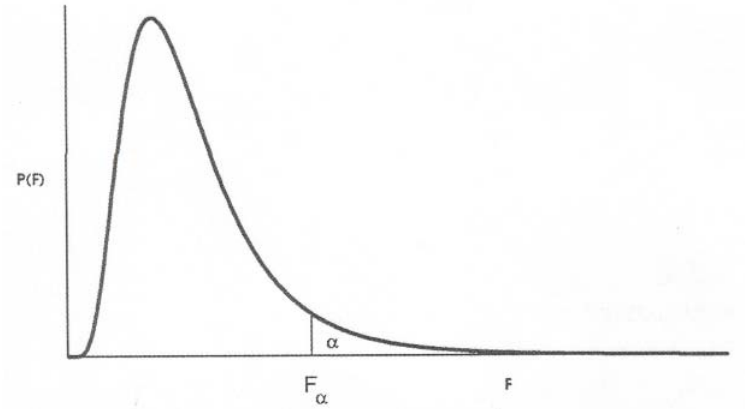


Figure K.1: The F distribution

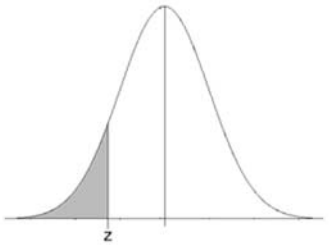
F Values for $\alpha = 0.01$

d_2 \ d_1	1	2	3	4	5	6	7	8	9
1	4052	4999.5	5403	5625	5764	5859	5928	5982	6022
2	98.50	99.00	99.17	99.25	99.30	99.33	99.36	99.37	99.39
3	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.35
4	21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66
5	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	10.16
6	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.98
7	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72
8	11.26	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91
9	10.56	8.02	6.99	6.42	6.06	5.80	5.61	5.47	5.35
10	10.04	7.56	6.55	5.99	5.64	5.39	5.2	5.06	4.94
11	9.65	7.21	6.22	5.67	5.32	5.07	4.89	4.74	4.63
12	9.33	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.39
13	9.07	6.70	5.74	5.21	4.86	4.62	4.44	4.30	4.14
14	8.86	6.51	5.56	5.04	4.69	4.46	4.28	4.14	4.03
15	8.68	6.36	5.42	4.89	4.56	4.32	4.14	4.00	3.89
16	8.53	6.23	5.29	4.77	4.44	4.20	4.03	3.89	3.78
17	8.40	6.11	5.18	4.67	4.34	4.10	3.93	3.79	3.68
18	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.60
19	8.18	5.93	5.01	4.50	4.17	3.94	3.77	3.63	3.52
20	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.46
21	8.02	5.78	4.87	4.37	4.04	3.81	3.64	3.51	3.40
22	7.95	5.72	4.82	4.31	3.99	3.76	3.59	3.45	3.35
23	7.88	5.66	4.76	4.26	3.94	3.71	3.54	3.41	3.30
24	7.82	5.61	4.72	4.22	3.90	3.67	3.50	3.36	3.26
25	7.77	5.57	4.68	4.18	3.85	3.63	3.46	3.32	3.22

F Values for $\alpha = 0.05$

	d_1								
d_2	1	2	3	4	5	6	7	8	9
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5
2	18.51	19.00	19.16	19.25	19.3	19.33	19.35	19.37	19.38
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96
inf	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88

Standard Normal Cumulative Probability Table



Cumulative probabilities for NEGATIVE z-values are shown in the following table:

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
-3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
-3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
-3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641