國立臺北大學 115 學年度日間學士班轉學生招生考試試題

學制系級：統計學系日間學士班 2、3 年級

金融與合作經營學系日間學士班 3 年級

科　　目：統計學

☑可 ☐不可 使用計算機

1. (10%) Two cards are randomly chosen without replacement from an ordinary deck of 52 cards. Let B be the event that both cards are aces, let A_s be the event that the ace of spades is chosen, and let A be the event that at least one ace is chosen. Find
   (a) (5%) $P(B|A_s)$
   (b) (5%) $P(B|A)$

2. (15%) Consider the experiment of tossing a fair coin three times. Let X denote the number of heads on the first two tosses and Y denote the number of heads on all three tosses.
   (a) (6%) Find the joint probability mass function (pmf) of (X,Y).
   (b) (4%) Find the marginal probability mass function (pmf) and the cumulative distribution function (cdf) of X.
   (c) (5%) Compute the correlation coefficient of X and Y.

3. (15%) Let X is an exponential random variable with rate λ. Let a denote a constant, $a > 0$, and $Y = ae^X$
   (a) (5%) Find the cumulative density function (cdf) of Y.
   (b) (2%) Find the probability density function (pdf) of Y.
   (c) (8%) Find E(Y) and Var(Y)

4. (10%) China Airline quote a flight time of 2 hours, 5 minutes for its flights from Taipei to Shanghai. Suppose we believe that actual flight times are uniformly distributed between 2 hours and 2 hours, 20 minutes.
   (a) (5%) What is the probability will be more than 10 minutes late?
   (b) (5%) What are the mean and variance of the flight times?

5. (10%) The following results come from two independent random samples taken of two different normal populations. Assume that two variances are unknown, but they are the same.

Sample 1	Sample 2
n=15	m=10
$\bar{x} = 13.6$	$\bar{y} = 11.6$
$S_x = 2.2$	$S_y = 3.0$

   (a) (5%) What is the point estimate of the difference between the two population means?
   (b) (5%) Find a 95% confidence interval for the different between the two population means.

6. (10%) The following table contains observed frequencies of a sample of 500. Test for independence of the row and column variables using α=0.01 level of significance.

		Column variable	
Row variable	A	B	C
P	40	20	80
Q	70	30	60
R	90	50	60

7. (10%) In an experiment to investigate the performance of four different brands of tires for 125-cc motorcycles, five tires of each brand were tested and number of miles until failure was observed. A partially completed ANOVA table is given:

Source of variation	Sum of Squares	Degrees of Freedoms	Mean Square	F-value
Treatments	(?)	(?)	(?)	(?)
Error	235419	(?)	(?)	
Total	310501	(?)		

   (a) (7%) Complete the ANOVA table.
   (b) (3%) At the $\alpha = 0.05$ level of significance, test whether the average number of miles until failure for the four different brands of tires are equal.

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接背面

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8. (20%) Given are following observations collected in a regression study on two variables. Consider the linear regression model

$Y = \beta_0 + \beta_1 X + \varepsilon$

x_i	2	3	4	5	6
y_i	3	7	5	11	14

(a) (5%) Find the estimated regression equation for these data.

(b) (5%) Use the estimated regression equation to predict the value of y when x=7.

(c) (5%) Find the coefficient of determination R^2.

(d) (5%) Use F test to test the hypotheses H_0: $\beta_1 = 0$ vs. H_a: $\beta_1 \neq 0$ at 0.05 level of significance.

The following table is the **cumulative probabilities** for the standard distribution

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	0.9924	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	0.9958	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

Notes: The attached probability value is the probability in the upper tails of Chi_square (χ^2), or t_distribution or F distribution.

$t_{0.025}(23)=2.069$ $t_{0.05}(23)=1.714$ $t_{0.025}(24)=2.064$ $t_{0.05}(24)=1.711$

$\chi^2_{0.05}(3) = 7.815$ $\chi^2_{0.01}(3) = 11.345$ $\chi^2_{0.05}(4) = 9.488$ $\chi^2_{0.01}(4) = 13.277$ $\chi^2_{0.025}(4)=11.143$

$F_{0.05}(16,3) = 8.69$ $F_{0.05}(3,16) = 3.24$ $F_{0.025}(3,16) = 4.08$

$F_{0.05}(1,3) = 10.13$ $F_{0.05}(3,1) = 251.71$ $F_{0.025}(3,1) = 864.15$

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