

東吳大學 104 學年度轉學生(含進修學士班轉學生)招生考試試題

第 1 頁，共 2 頁

系級	財務工程與精算數學系三年級	考試時間	100 分鐘
科目	機率與統計	本科總分	100 分

1. (20 pts) Let X_1 and X_2 be independent random variable, each with *p.d.f.*

$$f_X(x) = \frac{1}{\theta} e^{-x/\theta}, \quad x \geq 0$$

Let $Y = X_1 - X_2$ and $Z = \frac{X_1}{X_1 + X_2}$.

- (a) Find the distribution of Y . (10 pts)
 (b) Find the distribution of Z . (10 pts)
2. (20 pts) Let X and Y have the joint *p.d.f.*
- $$f_{XY}(x, y) = k, \quad 0 \leq x \leq y \leq 2$$
- (a) Find k . (5 pts)
 (b) Find the marginal *p.d.f.* of Y . (5 pts)
 (c) Find $P(X \leq 1 | Y = 1.5)$. (5 pts)
 (d) Find $E(X | Y = 1.5)$. (5 pts)
3. (20 pts) Let X_1, X_2, \dots, X_{100} be a random sample from $U(-1, 1)$
- (a) Find the mean and variance of X_1 . (2+3 pts)
 (b) Find $P(X_1 > 0.1)$. (5 pts)
 (c) Find $P(X_1 + X_2 > 0.2)$. (5 pts)
 (d) Find $P(X_1 + X_2 + \dots + X_{100} > 10)$. (5 pts)
4. (20 pts) Customers arrive at a travel agency at a mean rate of 10 per hour. Assume the number of arrivals follows Poisson distribution.
- (a) Find the probability that at least one customer in 20-minute period. (5 pts)
 (b) Find the probability that exactly one customer in 10-minute period. (5 pts)
 (c) Find the probability that the waiting time between the 10th customer and the 11th customer is over 10 minutes. (5 pts)
 (d) Find the probability more than 80 customers in any working day. Assume the agency opens 8 hours a day. (5 pts)
5. (20 pts) A packaged product has a label of 400 grams in a container, it must contain at least 400 grams, or it is under the labeled weight. If the content of a container has a normal $N(\mu = 405, \sigma^2)$ distribution.
- (a) Find σ , so that the probability of under the labeled weight is 1%. (5 pts)
 (b) If $\sigma = 5$ grams, find the probability that a container contains more than 400 grams. (5 pts)
 (c) If $\sigma = 5$ grams, find the probability that two containers contains more than 800 grams. (5 pts)
 (d) If $\sigma = 5$ grams, find the probability that at least one of the two containers is under the labeled weight. (5 pts)

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The Normal Distribution $P(Z \leq z) = \Phi(z) = \int_{-\infty}^z \frac{1}{\sqrt{2\pi}} e^{-w^2/2} dw$ $\Phi(-z) = 1 - \Phi(z)$

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	0.7703	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