

國立中央大學 108 學年度碩士班考試入學試題

所別： 工業管理研究所碩士班 不分組(一般生)

共 3 頁 第 1 頁

科目： 統計學

本科考試可使用計算器，廠牌、功能不拘

*計算題需計算過程，無計算過程者不予計分

1. Consider a stochastic activity network as shown in Figure 1 with five activities, A_1, \dots, A_5 . Node S denotes project starting and node T denotes project completion. The directed arrows in a stochastic activity network denote not only activities but also precedence constraints. The precedence constraints are as follows. A_2 and A_3 can only be started after A_1 is completed, and A_5 can only be started after A_3 and A_4 are completed. The project is completed after all five activities are completed. Let $D_i \sim \text{Exp}(1)$ denote the independent duration of activity A_i , $i = 1, \dots, 5$, and let C_i denote the earliest completion time of node $i = S, A, B, T$. Our goal is to compute the marginal distribution of the earliest completion time of the project, we will assume that each activity will be started as soon as possible (after completion of all preceding activities). Also, we assume that $C_S = 0$.

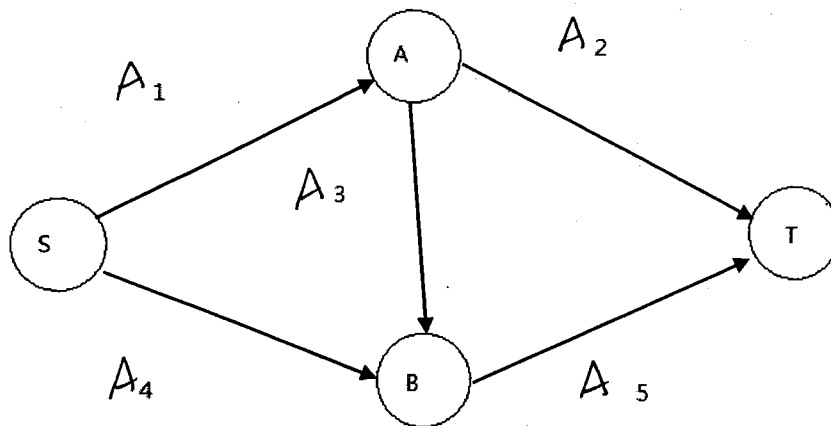


Figure 1 Stochastic Activity Network

- Express C_B in terms of C_i and D_i (5 points)
- Determine the conditional CDF of C_B given $D_1 = x$ (10 points)
- Determine the conditional CDF of $C_B + D_5$ given $D_1 = x$ and $D_5 = y$ (5 points)
- Express C_T in terms of C_i and D_i (5 points)
- Determine the conditional CDF of C_T given $D_1 = x$ (10 points)

注意:背面有試題

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2. The moment generating function of random variable X is defined as follows:

$$M_X(t) = E[e^{tX}] = \int_{-\infty}^{\infty} e^{tx} f(x) dx$$

, where $f(x)$ is the pdf of X .

(a) Find the moment generating function of X , where X is $U(0,1)$ distributed. (5 points)

(b) Find $E[Y^2]$ from the moment generating function of Y , where $Y = X + Z$, X and Z are independent and $U(0,1)$ distributed. (10 points)

3. To test a particular coin fair or not, (i.e. $p = \Pr(\text{"head"}) = 0.5$), we decide to flip the coin n times. Let X denote the number of heads appearing in n flips.

(a) Please provide a M.L.E. of p ; (5 points)

(b) Let $n = 4$, try to use X to be the test statistics to develop a test on $H_0: p = 0.5$

(1) Show the distribution of X . (5 points)

(2) Let's set the significant level, α , to be 0.15, show the rejection rule. (5 points)

(3) Based on your rejection rule in (b-2), what is the testing power on $H_a: p = 0.3$? (5 points)

(4) If only one head appears in 4 flips, what is your conclusion? (5 points)

(5) Please develop a 85% confidence interval of p . (5 points)

(c) If $n = 50$, let's use $Y = X/n$ to be the test statistics to test on $H_0: p = 0.5$

(1) Since $n = 50$, we can invoke the Central Limit Theory, show the approximate distribution of Y . (5 points)

(2) Let's set the significant level, α , to be 0.15, show the rejection rule. In other words, what is the critical number of heads appearing to reject H_0 . (5 points)

(3) Based on your rejection rule in (c-2), what is the testing power on $H_a: p = 0.3$? (5 points)

(4) Please develop a 85% confidence interval of p . (5 points)

參考用

注意:背面有試題

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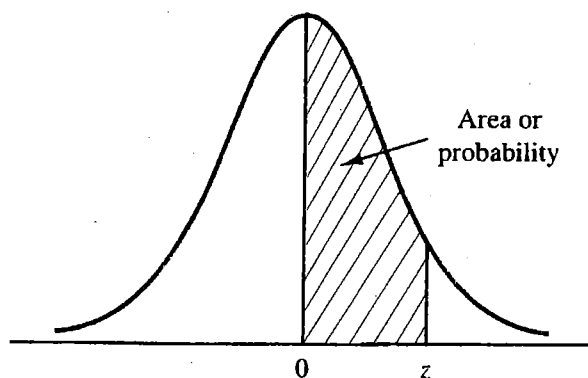
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Entries in the table give the area under the curve between the mean and z standard deviations above the mean. For example, for $z = 1.25$ the area under the curve between the mean and z is .3944.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4986	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

參考用