國立成功大學

115學年度碩士班招生考試試題

編　號：194

系　所：環境醫學研究所

科　目：生物統計

日　期：0204

節　次：第 2 節

注　意：1.可使用計算機
2.請於答案卷(卡)作答，於試題上作答，不予計分。

Please provide complete and detailed calculations. If only answers are provided, then no credits are to be given.

A. (20% with 10% each)

Blood pressure in childhood tends to increase with age, but differently for boys and girls. Suppose that for both boys and girls, mean systolic blood pressure (SBP) is 95 mm Hg at 3 years of age and increases 1.5 mm Hg per year up to the age of 13. Furthermore, starting at age 13, the mean increases by 2 mm Hg per year for boys and 1 mm Hg per year for girls up to the age of 18.

Finally, assume that blood pressure is normally distributed and that the standard deviation is 12 mm Hg for all age-sex groups.

1. What is the probability that a 15-year-old girl will have an SBP between 100 and 120 mm Hg?
2. What is the probability that at least 10 will have an SBP of 130 mm Hg or greater among 200 15-year-old boys?

B. (20% with 10% each)

It is known that 5% of the books bound at a certain bindery have defective binding. Find the probability that 2 of 100 books bound by this bindery will have defective bindings, using

1. the formula for the binomial distribution;
2. the Poisson approximation to the binomial distribution.

C. (20% with 10% each)

If a bank receives on the average $\alpha = 6$ bad checks per day, what are the probabilities that it will receive

1. 4 bad checks on any given day?
2. 10 bad checks over any 2 consecutive days?

D. (20% with 10% each)

If X_1 has mean 4 and variance 9, while X_2 has mean -2 and variance 5. The 2 random variables are independent, find

1. $E(2X_1 + X_2 - 5)$
2. $Var(2X_1 + X_2 - 5)$

E. (20%)

Prove that for the Poisson distribution

$$\frac{f(x+1;\ \lambda)}{f(x;\ \lambda)} = \frac{\lambda}{x+1} \quad \text{for } x = 0, 1, 2, 3 \ldots\ldots$$

STANDARD NORMAL DISTRIBUTION: Table Values Represent AREA to the LEFT of the Z score.

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.50000	.50399	.50798	.51197	.51595	.51994	.52392	.52790	.53188	.5358
0.1	.53983	.54380	.54776	.55172	.55567	.55962	.56356	.56749	.57142	.5753
0.2	.57926	.58317	.58706	.59095	.59483	.59871	.60257	.60642	.61026	.6140
0.3	.61791	.62172	.62552	.62930	.63307	.63683	.64058	.64431	.64803	.6517
0.4	.65542	.65910	.66276	.66640	.67003	.67364	.67724	.68082	.68439	.6879
0.5	.69146	.69497	.69847	.70194	.70540	.70884	.71226	.71566	.71904	.7224
0.6	.72575	.72907	.73237	.73565	.73891	.74215	.74537	.74857	.75175	.7549
0.7	.75804	.76115	.76424	.76730	.77035	.77337	.77637	.77935	.78230	.7852
0.8	.78814	.79103	.79389	.79673	.79955	.80234	.80511	.80785	.81057	.8132
0.9	.81594	.81859	.82121	.82381	.82639	.82894	.83147	.83398	.83646	.8389
1.0	.84134	.84375	.84614	.84849	.85083	.85314	.85543	.85769	.85993	.8621
1.1	.86433	.86650	.86864	.87076	.87286	.87493	.87698	.87900	.88100	.8829
1.2	.88493	.88686	.88877	.89065	.89251	.89435	.89617	.89796	.89973	.9014
1.3	.90320	.90490	.90658	.90824	.90988	.91149	.91309	.91466	.91621	.9177
1.4	.91924	.92073	.92220	.92364	.92507	.92647	.92785	.92922	.93056	.9318
1.5	.93319	.93448	.93574	.93699	.93822	.93943	.94062	.94179	.94295	.9440
1.6	.94520	.94630	.94738	.94845	.94950	.95053	.95154	.95254	.95352	.9544
1.7	.95543	.95637	.95728	.95818	.95907	.95994	.96080	.96164	.96246	.9632
1.8	.96407	.96485	.96562	.96638	.96712	.96784	.96856	.96926	.96995	.9706
1.9	.97128	.97193	.97257	.97320	.97381	.97441	.97500	.97558	.97615	.9767
2.0	.97725	.97778	.97831	.97882	.97932	.97982	.98030	.98077	.98124	.9816
2.1	.98214	.98257	.98300	.98341	.98382	.98422	.98461	.98500	.98537	.9857
2.2	.98610	.98645	.98679	.98713	.98745	.98778	.98809	.98840	.98870	.9889
2.3	.98928	.98956	.98983	.99010	.99036	.99061	.99086	.99111	.99134	.9915
2.4	.99180	.99202	.99224	.99245	.99266	.99286	.99305	.99324	.99343	.9936
2.5	.99379	.99396	.99413	.99430	.99446	.99461	.99477	.99492	.99506	.9952
2.6	.99534	.99547	.99560	.99573	.99585	.99598	.99609	.99621	.99632	.9964
2.7	.99653	.99664	.99674	.99683	.99693	.99702	.99711	.99720	.99728	.9973
2.8	.99744	.99752	.99760	.99767	.99774	.99781	.99788	.99795	.99801	.9980
2.9	.99813	.99819	.99825	.99831	.99836	.99841	.99846	.99851	.99856	.9986
3.0	.99865	.99869	.99874	.99878	.99882	.99886	.99889	.99893	.99896	.9990
3.1	.99903	.99906	.99910	.99913	.99916	.99918	.99921	.99924	.99926	.9992
3.2	.99931	.99934	.99936	.99938	.99940	.99942	.99944	.99946	.99948	.9995
3.3	.99952	.99953	.99955	.99957	.99958	.99960	.99961	.99962	.99964	.9996
3.4	.99966	.99968	.99969	.99970	.99971	.99972	.99973	.99974	.99975	.9997
3.5	.99977	.99978	.99978	.99979	.99980	.99981	.99981	.99982	.99983	.9998
3.6	.99984	.99985	.99985	.99986	.99986	.99987	.99987	.99988	.99988	.9998
3.7	.99989	.99990	.99990	.99990	.99991	.99991	.99992	.99992	.99992	.9999
3.8	.99993	.99993	.99993	.99994	.99994	.99994	.99994	.99995	.99995	.9999
3.9	.99995	.99995	.99996	.99996	.99996	.99996	.99996	.99996	.99997	.9999