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UNIVERSITY DRAFT-RESITS/RETAKE EXAMINATIONS 2015/2016

SEMESTER 1 FIRST YEAR BSC EXAMS

SMA32310: PROBABILITY AND STATISTICS

May, 2016 Time 2hours

Instructions

Answer Question1 and TWO other questions.

Show all the necessary working

Question 1:[30 marks] COMPULSORY

(a) Find the mean ,standard deviation and variance of the following data:

X	22	24	25	33	36	37	41
f	5	7	8	4	6	9	11

(8 marks)

(3 marks)

(b) A random variable X has a distribution with its probability density function given as:

$$f_X(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{\frac{-(x-\mu)^2}{2\sigma^2}}.$$

Identify the distribution of X , the parameters μ and σ. (4 marks)

(c) Let $X \sim N(10, 25)$, compute

(i) $P(X \le 20)$ (3 marks)

(ii) $P(X > 5)$ (4 marks)

(iii) $P(12 \le X \le 15)$ (4 marks)

(c) For the grouped data below, construct the Ogive curve.

Mass (X)	20-24	25-29	30-34	35-39	40-44
Frequency (f)	4	10	16	8	2

(5marks).

(d) Consider a Poisson distributed random variable X with probability density function

$$f(x) = \frac{e^{-\lambda}\lambda^x}{x!}, \ \lambda > 0 \qquad x = 0,1,2,3,.....$$

i) If the $pr(x = 0) = 0.2$ determine the value of the parameter λ. (2 marks)

ii) Find the probability that the random variable $X \ge 3$. (4marks).

Question 2: [20 marks]

Given the raw data of 80 heights of plants measured during an experiment in centimeters below

(a) Use tallying marks to group the data with uniform class width of 7 centimeters. (6marks)

(b) Compute the mean height of plants from the grouped data. (8marks)

(c) Determine class interval containing each of the; mean , mode , median. (6marks)

93 85 76 76 90 72 57 84 73 86 77 76 62 85 63 68 82 67 75 68
75 53 95 71 85 74 73 62 75 61 75 53 62 85 93 88 97 79 73 65
74 85 71 53 78 60 81 80 88 73 72 71 76 63 62 78 61 65 67 79
71 68 69 83 95 94 87 78 82 66 60 83 60 68 77 75 75 78 89 96

Question 3: [20 marks]

(a) Consider a Poisson distributed random variable X with probability density function

$$f(x)=\frac{e^{-\lambda}\lambda^{x}}{x!},\ \lambda>0 \qquad x=0,1,2,3,.....$$

i) If the $pr(x=0)=0.2$ determine the value of the parameter λ. (3 marks)

ii) Find the probability that the random variable $X \geq 3$. (5marks).

(b) i) Find the probability of exactly one 5 when a die is rolled 3 times

ii) Find the probability of getting 3 heads when 8 coins are tossed.

iii) A bag contains 4 red and 2 green balls. A ball is drawn and replaced 4 times. What is the probability of getting exactly 3 red balls and 1 green ball. (12marks).

Question4: [20 marks]

(a). The continuous random variable X, has a probability density function where

$$f(x)=\begin{cases} k & 0\leq x<2 \\ k(2x-3) & 2\leq x\leq 5 \\ 0 & otherwise \end{cases}$$

i). Find the value of the constant k

ii). Sketch the probability density function y=f(x)

iii). Find P(X ≤ 1)

iv). Find P(X>2.5)

(b) A random variable X is known to have a moment generating function $M_X(t)=\left(\frac{1}{1-\beta t}\right)^{\alpha}$ with real parameters α , β.

Determine the expectations $E(X)$, $E(X^2)$ of X.

Question 5: [20 marks]

Determine the relationship between hours studied and grade on a quiz on seven pairs of data. Maximum grade on quiz is 15.

X is hours studied; Y is grade on quiz.

X	1	2	3	4	5	6	7
Y	5	8	9	10	11	12	14

(a) Calculate

(i) the correlation coefficient, r .

(ii) the coefficient of determination.

(iii) the regression coefficient b1 (the slope).

(iv) the regression coefficient b0 (the Y-intercept, or constant). (10 marks)

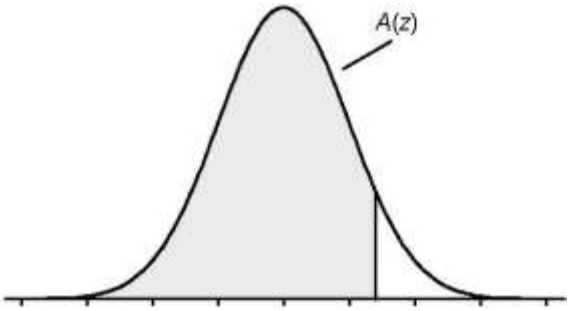
(b)Explain the meaning of the regression coefficients. (5 marks)

(c) If someone studies 5.3 hours, what would we predict his/her quiz score to be? (5 marks)

The Short student t Table: ***Critical Values of t***

Degrees of Freedom	*Upper Tail Areas*					
	.25	*.10*	*.05*	*.025*	*.01*	*.005*
1	1.0000	3.0777	6.3138	12.7062	31.8207	63.6574
2	0.8165	1.8856	2.9200	4.3027	6.9646	9.9248
3	0.7649	1.6377	2.3 534	3.1824	4.5407	5.8409
4	0.7407	1.5332	2.1318	2.7764	3.7469	4.6041
5	0.7267	1.4 759	2.0150	2.5706	3.3649	4.0322
6	0.7176	1.4398	1.9432	2.4469	3.1427	3.7074
7	0.7111	1.4149	1.8946	2.3646	2.9980	3.4995
8	0.7064	1.3968	1.8595	2.3060	2.8965	3.3554
9	0.7027	1.3830	1.8331	2.2622	2.8214	3.2498
10	0.6998	1.3722	1.8125	2.2281	2.7638	3.1693
11	0.6974	1.3634	1.7959	2.2010	2.7181	3.1058
12	0;6955	1.3562	1. 7823	2.1788	2.6810	3.0545
13	0.6938	1.3502	1.7709	2.1604	2.6503	3.0123
14	0.6924	1.3450	1.7613	2.1448	2.6245	2.9768
15	0.6912	1.3406	1.7531	2.1315	2.6025	2.9467
16	0.6901	1.3368	1.7459	2.1199	2.5835	2.9208
17	0.6892	1.3334	1.7396	2.1098	2.5669	2.8982
18	0.6884	1.3304	1.7341	2.1009	2.5524	2.8784
19	0.6876	1.3277	1.7291	2.0930	2.5395	2.8609
20	0.6870	1.3253	1.7247	2.0860	2.5280	2.8453
21	0.6864	1.3232	1.7207	2.0796	2.5177	2.8314
22	0.6858	1.3212	1.7171	2.0739	2.5083	2.8188
23	0.6853	1.3195	1.7139	2.0687	2.4999	2.8073
24	0.6848	1.3178	1.7109	2.0639	2.4922	2.7969
25	0.6844	1.3163	1.7081	2.0595	2.4851	2.7874
26	0.6840	1.31 50	1.7056	2.0555	2.4786	2.7787
27	0.6837	1.3137	1.7033	2.0518	2.4727	2.7707
28	0.6834	1.3125	1.7011	2.0484	2.4671	2.7633
29	0.6830	1.3114	1.6991	2.0452	2.4620	2.7564
30	0.6828	1.3104	1.6973	2.0423	2.4573	2.7500
31	0.6825	1.3095	1.6955	2.0395	2.4528	2.7440
32	0.6822	1.3086	1.6939	2.0369	2.4487	2.1385
33	0.6820	1.3077	1.6924	2.0345	2.4448	2.7333
34	0.6818	1.3070	1.6909	2.0322	2.4411	2.7284
35	0.6816.	1.3062	1.6896	2.0301	2.4377	2.7238
36	0.6814	1.3055	1.6883	2.0281	2.4345	2.7195
37	0.6812	1.3049	1.6871	2.0262	2.4314	2.7154
38	0.6810	1.3042	1.6860	2.0244	2.4286	2.7116
39	0.6808	1.3036	1.6849	2.0227	2.4258	2.7079
40	0.6807	1.3031	1.6839	2.0211	2.4233	2.7045
41	0.6805	1.3025	1.6829	2.0195	2.4208	2.7012
42	0.6804	1.3020	1.6820	2.0181	2.4185	2.6981
4J	0.6802	1.3016	1.6811	2.0167	2.4163	2.6951
...	...	...	...	...	...	...
∞			**1.645**	**1.96**	**2.33**	**2.575**

Cumulative Standardized Normal 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	0.9925	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
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999							