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DOON UNIVERSITY
2005

School of Environment & Natural Resources (SENR)
End-Semester 2015 (Monsoon Semester)
M.Sc. 3rd Sem
EES-554 : Statistics & Computer Applications

Max Marks : 30 **Time : 3 hours**

Use of Calculator is permitted
z-score table is provided at the end

Section A : Multiple Choice Questions **(1 Marks each)**

1. The following statistical test is used to ascertain whether there is significant difference between the variances of two sets of observations :
   (A) t-test
   (B) F-test
   (C) Chi square test
   (D) Regression

2. If the mean of a sample is 20, the standard error of mean is 1 and the t-statistic for 95% level of confidence is 2.5, the population mean will be in the range
   (A) 17.5 to 22.5
   (B) 15 to 25
   (C) 20 to 25
   (D) 15 to 20

3. In a simple regression analysis of y on x, the standard error of estimate of y on x, S_{yx} = 5, number of observations N is 30, The unexplained variation is
   (A) 1500
   (B) 750
   (C) 500
   (D) 250

4. The events A and B are mutually exclusive. If P(A) = 0.5 and P(B) = 0.2, then what is P(A& B) ?
   (A) 0.5
   (B) 0.1
   (C) 0.7
   (D) 0.3

5. The standard deviation of weights of certain 1 kg packets of milk is 10 grams. A random sample of 20 packets showed a standard deviation of 15 grams. The value of χ^2 statistic for the sample is

(A) 30
(B) 45
(C) 1.5
(D) 0.66

6. A sample size of 17 observations is selected from a normal population with mean = 50. The sample mean and variance are 48 and 8 respectively. The value of t – statistic is
   (A) 0.25
   (B) – 2.82
   (C) – 2.2
   (D) 0.71

7. A class has equal number of boys and girls. The standard deviations of their weights are S_g = 2 kg for girls and S_b = 2 kg for boys. What is the combined variance of the weights of the whole class ?
   (A) 29
   (B) 16
   (C) 8
   (D) 19

8. For the following Poisson distribution
   $$P(x) = \frac{2^x e^{-2}}{x!} \; ; \; x = 0, 1, 2, \ldots\ldots$$
   the value of the mean is
   (A) 2
   (B) 4
   (C) 1
   (D) 1

9. For large population sizes, the t-distribution approaches
   (A) Normal distribution
   (B) Poisson distribution
   (C) Binomial distribution
   (D) Chi-square distribution

10. The standard deviation of a sampling distribution of a statistic (means) is called its:
    (A) Root mean square,
    (B) standard error
    (C) second moment about mean,
    (D) none of the above

Section B : Answer any FOUR of the following (5 Marks each)

11. Find the area under the normal curve in each of the following cases,
    (a) Between z = -1 and z = 1
    (b) Between z=-1.96 and z=1.96
    (c) To the right of z = 2.05
    Use the z-score table given.

12. The breaking strengths of cables produced by a manufacturer have a mean of 1800 pounds (lb) and a standard deviation of 100 lb. By a new technique in the manufacturing process, it is claimed that the breaking strength can be increased. To test this claim, a sample of 50 cables is tested and it is found that the mean breaking strength is 1850 lb. Can we support the claim at the 0.01 significance level?

13. A Christmas tree farm has 5000 trees that are mature and ready to be cut and sold. 100 of the trees are randomly selected and their heights measured. The mean (μ_{s1}) and standard deviation (σ_{s1}) of the sampled trees are given as 59.22 and 10.11 inches. Set a 95% confidence interval on the mean height of all 5000 trees. If the trees sell for $2.40 per foot, give a lower and upper bound on the value of the 5000 trees.

14. Find the best fitted line in the least square sense for the following set of data. Use X as independent variable and Y as dependent variable. Also, calculate R^2 value. What is the significance of R^2 value?

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

(Hints : Calculate regression coefficients either by solving two normal linear equations, or, use the following formula to calculate a_0 and a_1 in the regression equation $Y = a_0 + a_1 X$

$a_0 = \frac{(\Sigma Y)(\Sigma X^2)-(\Sigma X)(\Sigma XY)}{N\Sigma X^2-(\Sigma X)^2}$; $a_1 = \frac{N\Sigma XY-(\Sigma X)(\Sigma Y)}{N\Sigma X^2-(\Sigma X)^2}$)

15. What is PERT ? What is CPM? How is CPM used in PERT? How do we optimize time in a large project? Illustrate with an example.

16. What do you understand by binomial, normal and poisson distributions? What's the difference between binomial and normal distribution? Where do we use poisson distribution?

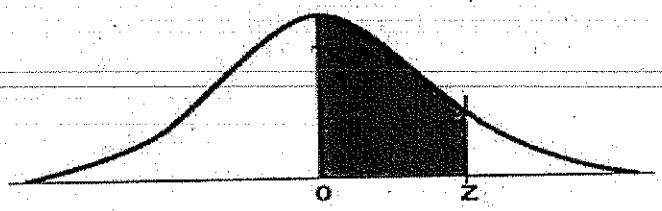
17. What is z-score? What is a standard error? What is null hypothesis? What are type I and type II errors? What are confidence intervals?

Supplementary Tables

Table 1 . Table for z-score test:

Level of Significance α	0.10	0.05	0.01	0.005	0.002
Critical Values of z for one tailed tests	-1.28 or 1.28	-1.645 or 1.645	-2.33 or 2.33	-2.58 or 2.58	-2.88 or 2.88
Critical Values of z for one tailed tests	-1.645 and 1.645	-1.96 and 1.96	-2.58 and 2.58	-2.81 and 2.81	-3.08 and 3.08

Table 2 .



This table presents the area between the mean and the Z score . When Z=1.96, the shaded area is 0.4750.

Areas Under the Standard Normal Curve

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.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	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4995	.4995	.4995
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4996	.4996	.4997
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4997	.4997	.4998
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.6	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.9	.5000									

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