21-12-2015

School of Environment & Natural Resources (SENR)
End-Semester Exam 2015 (Monsoon Semester)
M.Tech. - 3rd Sem
ETE-591 : Statistical Application

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. 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) 0.7

2. 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

3. t-distribution is approximately normal for sample size
   (A) $\geq$30 ; (B) $\geq$ 10 ; (C) $\geq$ 15 ; (D) $\geq$20

4. Two sets of data consisting of 10 and 20 observations have same mean 8 with standard deviations of 1 and 2, respectively. If the two data sets are combined, then the variance is
   (A) 3 ; (B) 2 ; (C) 5 ; (D) 1.5

5. In Binomial distribution with number of trials N = 9 and mean μ = 6, the standard deviation is :
   (A) $\sqrt{2}$; (B) 2 ; (C) 3/2 ; (D) 2/3

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

7. An estimate of a population parameter given by two numbers in which the parameters may be considered to lie is called :
   (A) Interval estimate of the parameter; (B) interval estimator of the parameter
   (C) Point estimate of the parameter; (D) none of the above

8. If a test rejects the hypothesis when it is true, we say that:
   (A) Type I error is made ; (B) type II error is made;

(C) either type I or type II error is made; (D) none of the above

9. 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

10. 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

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

11. A group of 50 internet shoppers were asked how much they spent per year on the internet. The survey reveals a mean of $304.60 and standard deviation of $325. Test the hypothesis using 95% confidence interval. Calculate p-value and test the hypothesis at level of significance 0.05.

12. Find the area under the normal curve in each of the following cases,
(a) Between z = -2 and z = 2
(b) Between z=-1 and z=1
(c) To the right of z = 2.05
Use the z-score table given.

13. In an experiment on extra-sensory perception (ESP), an individual in one room is asked to state the color (red or blue) of a card chosen from a deck of 50 well shuffled cards by an individual in another room. It is unknown to the subject how many red or blue cards are in the deck. If the subject identifies 32 cards correctly, determine whether results are significant at the (a) 0.05 and (b) 0.01 levels of significance.

14. 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?

15. What is test of hypothesis? How is null hypothesis formulated? What are critical values? What is confidence interval?

16. What are t, F, and χ^2 statistics? What are their significance? Describe the context in which each of the statics is used.

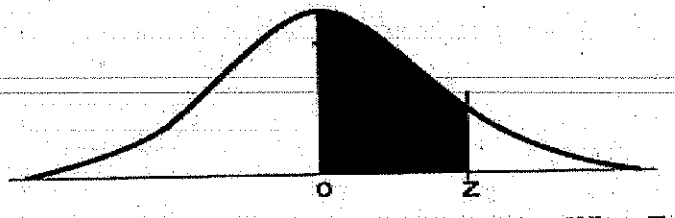
17. What are unbiased estimates? What are efficient estimates? Comment upon point estimates and interval estimates and their reliability.

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	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
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									

Source: Adapted by permission from *Statistical Methods* by George W. Snedecor and William G. Cochran, sixth edition © 1967 by The Iowa State University Press, Ames, Iowa, p. 548.