1st SEM.2010/2011

UNIVERSITY OF SWAZILAND

SUPPLEMENTARY EXAMINATION PAPER

PROGRAMME: Bachelor of Science in Agricultural and Biosystems Engineering Year II
Bachelor of Science in Agricultural Economics and Agribusiness Year II
Bachelor of Science in Agricultural Education Year II
Bachelor of Science in Agronomy Year II
Bachelor of Science in Animal Science Year II
Bachelor of Science in Consumer Science Year II
Bachelor of Science in Consumer Science Education Year II
Bachelor of Science in Food Science, Nutrition and Technology Year II
Bachelor of Science in Horticulture Year II
Bachelor of Science in Textile and Apparel Design and Management Year II

COURSE TITLE: ELEMENTARY STATISTICS

COURSE CODE: AEM 201

TIME ALLOWED: TWO (2) HOURS

INSTRUCTION: THIS PAPER CONTAINS FIVE QUESTIONS;
ANSWER ANY FOUR QUESTIONS
EACH QUESTION CARRIES 25 MARKS

SPECIAL REQUIREMENTS: SCIENTIFIC CALCULATORS AND STATISTICAL TABLES

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Question 1

A random sample of 250 students majoring on Psychology or Communications at a large University is selected. The students are asked whether or not they are happy with their majors. The following table gives the results of the survey. Assume that none of the 250 students is majoring in both areas.

	Happy with major	Unhappy with major
Psychology	80	20
Communications	115	35

a. If one student is selected at random from this group, find the probability that this student is:
   i. happy with the choice of major
   ii. a Psychology major
   iii. a Communications major given that the student is happy with the choice of major
   iv. unhappy with the choice of major given that the student is a Psychology major
   v. a Psychology major and is happy with that major
   vi. a Communications major OR is unhappy with his or her major
b. Are "Psychology major" and "Happy with major" independent? Explain why or why not.

(3+3+4+4+3+4+4 marks)

Question 2

a) Twenty companies were asked whether or not they provide retirement benefits to their employees. Fourteen of the companies said they do provide retirement benefits to their employees and six said they do not. Five companies are randomly selected from these 20. Find the probabilities that:
   i. Exactly two of them provide retirement benefits to their employees. **(4 marks)**

b) An average of 5 customers come to the First National Bank every half hour.
   i. Find the probability that exactly two customers will come to this bank during a given hour. **(4 marks)**

(c) The life span of an automatic washer is approximately normally distributed, with mean and standard deviation equal to 3.1 and 1.2 years, respectively. If this type of washer is guaranteed for 1 year, what fraction of original sales will require replacement? **(7 marks)**

(d) Let X be a continuous random variable that is normally distributed with a mean of 65 and a standard deviation of 15. Find the probability that X assumes a value:
   i) Less than 43 ii) Greater than 74 iii) Between 56 and 71 **(3+3+4 marks)**

Question 3

(a) The following scores were obtained by UNISWA second year students on a Statistics test:

60	94	75	82	72	57	92	75	85	77	91	72	85	77
68	49	67	74	45	76	73	68	85	73	83	61	65	69
79	64	72	55	93	56	67	78	81	90	76	70	71	56
69	82	67	70	55	48	78	50						

(a) Calculate the inter-quartile range of these scores. **(10 marks)**

(b) The following table gives the frequency distribution of times (in minutes) that 50 commuter students at a large University spent looking for parking spaces on the first day of classes in the first semester of 2007.

Time	Number of students
0 to less than 4	4
4 to less than 8	7
8 to less than 12	15
12 to less than 16	18
16 to less than 20	6
20 to less than 24	3

Find the mean, median, variance and standard deviation of the distribution

(15 marks)

Question 4

(a) The amount of time that a drive-through bank teller spends on a customer is a random variable with a mean μ=3.2 minutes and a standard deviation σ=1.6 minutes. If a random sample of 64 customers is observed, find the probability that their mean time at teller's counter is:
(i) At most 2.7 minutes;
(ii) More than 3.5 minutes;
(iii) At least 3.2 minutes but less than 3.4 minutes. **(15 marks)**

(b) The average zinc concentration recovered from a sample of zinc measurements in 36 different locations is found to be 2.6 grams per millilitre. Find the 95% and 99% confidence intervals for the mean zinc concentration in the river. Assume the population standard deviation is 0.3. **(10 marks)**

Question 5

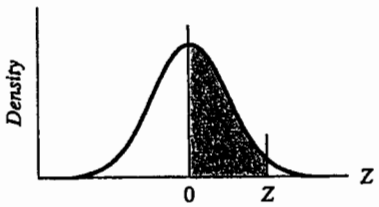
The manufacturer of a gasoline additive claims that the use of such additive increases gasoline mileage. A random sample of six cars was selected and these cars were driven for one week without the gasoline additive and then one week with the gasoline additive. The following table gives the miles per gallon for these cars without and with gasoline additive.

Without	24.6	28.3	18.9	23.7	15.4	29.5
With	26.3	31.7	18.2	25.3	18.3	30.9

(a) Using 2.5% significance level, can you conclude that the use of gasoline additive increases the gasoline mileage? **(15 marks)**

(b) Construct a 99 percent confidence interval for μ_d, where $\mu_d = \mu_{\text{without}} - \mu_{\text{with additive}}$ **(10 marks)**

TABLE V Normal Probabilities: Areas of the Standard Normal Distribution



The values in the body of the table are the areas between the mean and the value of Z.

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.00	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
.10	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
.20	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
.30	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
.40	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
.50	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
.60	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
.70	.2580	.2611	.2642	.2673	.2703	.2734	.2764	.2793	.2823	.2852
.80	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
.90	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.00	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.10	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.20	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.30	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.40	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.50	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.60	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.70	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.80	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.90	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.00	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.10	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.20	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.30	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.40	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.50	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.60	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.70	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.80	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.90	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.00	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.10	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.20	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.30	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.40	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.50	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998
3.60	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.70	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.80	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999

Note: For example, if we want to find the area under the standard normal curve between $Z = 0$ and $Z = 1.96$, we find the $Z = 1.90$ row and .06 column (for $Z = 1.90 + .06 = 1.96$) and read .4750 at the intersection.