DEPARTMENT OF STATISTICS AND DEMOGRAPHY

SUPPLEMENTARY EXAMINATION, 2009/10

COURSE TITLE:

DESCRIPTIVE STATISTICS

COURSE CODE:

ST 132

TIME ALLOWED:

TWO (2) HOURS

INSTRUCTION:

ANSWER ANY THREE QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS (20 MARKS)

SPECIAL REQUIREMENTS:

SCIENTIFIC CALCULATORS AND STATISTICAL TABLES

DO NOT OPEN THIS PAGE UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR

Question 1

- (a) A coin is biased so that a head is twice as likely to occur as a tail. If the coin is tossed 3 times, what is the probability of getting two tails and one head? (5 marks)
- (b) There are 90 applicants for a job with the news department of a television station. Some of them are college graduates and some are not, some have at least three years experience and some have not, with the exact breakdown being:

	College Graduate	Not College Graduate
At least three years experience	18	9
Less than three years experience	36	27

If the order in which the applicants are interviewed by the station manager is random, G is the event that the applicant interviewed is a college graduate, and T is the event that the applicant interviewed has at least three years experience, determine each of the following probabilities:

- (a) P(G)
- (b) P(T')
- (c) $P(G \cap T)$
- d) $P(G' \cap T')$

- (e) $P(T \mid G)$
- (f) P(G'|T')

(2+2+2+2+3+4 marks)

Question 2

Following is a distribution of the number of mistakes that 80 graduate students made in translating a passage from French to English as part of the language requirement for an advanced degree.

Number of mistakes	Number of students
0-4	34
5-9	20
10-14	15
15-19	9
20-24	2

Calculate

- (a) the mean;
- (b) the median;
- (c) the standard deviation

(5+5+5 marks)

(d) Following are the numbers of whales seen breaching on 60 whale-watching trips off the coast of baja California:

10	18	14	9	7	3	14	16	15	8	12	18
13	6	11	22	18	8	22	13	10	14	8	5
8	12	16	21	13	10	7	3	15	24	16	18
12	18	10	8	6	13	12	9	18	23	15	11
19	10	11	15	12	6	4	10	13	27	14	6

Group the data into a distribution with the classes 0-4, 5-9, 10-14, 15-19, 20-24 and 25-29. (5 marks)

Question 3

- a) A discrete random variable can be described by the binomial distribution if it satisfies four conditions. What are those conditions? (2 marks)
- b) 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.
 - ii. None of them provides retirement benefits to their employees.
 - iii. At most one of them provides retirement.

(3+3+3 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.
 - ii. Find the probability that during a given hour, the number of customers who will come to this bank is:
 - a. Fewer than five
 - b. Five or more

(3+3+3 marks)

Question 4

- (a) 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)
- (b) The average length of time required to complete a college achievement test was found to equal 70 minutes, with a standard deviation of 12 minutes. When should the test be terminated if you wish to allow sufficient time for 90% of the students to complete the test? (Assume that the time required to complete the test is normally distributed)

 (6 marks)
- (c) 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

(2+2+3 marks)

Question 5

(a) An automobile company wanted to investigate how the price of one of its models depreciates with age. The research department took a sample of eight cars of this model and collected the following information on the ages (in years) and prices (in thousands of dollars) of these cars.

Age	8	3	6	9	2	5	6	3
Price	18	94	50	21	145	42	36	99

- (i) Find the regression line with price as a dependent variable and age as an independent variable; interpret it and predict the price of a 7-year-old car of this model. (10 marks)
- (ii) Compute the Pearson's correlation coefficient for the two random variables (age and price).

 (10 marks)

END OF EXAM!!

0.1 .0398 .0438 .0478 .0517 .0557 .0596 .0636 .0675 .0714 .075 0.2 .0793 .0832 .0871 .0910 .0948 .0987 .1026 .1064 .1103 .114 0.3 .1179 .1217 .1255 .1293 .1331 .1368 .1406 .1443 .1480 .151 0.4 .1554 .1591 .1628 .1664 .1700 .1772 .1808 .1844 .187 0.5 .1915 .1950 .1985 .2019 .2054 .2088 .2123 .2157 .2190 .2222 0.6 .2257 .2291 .2324 .2357 .2389 .2422 .2454 .2486 .2517 .224 0.7 .2580 .2611 .2642 .2673 .2704 .2734 .2764 .2794 .2823 .2851 0.8 .2881 .2910 .2939 .2967 .2995 .3023 .3	Table	E The St	indaled Not	naldijsinb	dion **						
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1.8 .4641 .4649 .4656 .4664 .4671 .4678 .4686 .4693 .4699 .4706 1.9 .4713 .4719 .4726 .4732 .4738 .4744 .4750 .4756 .4761 .476 2.0 .4772 .4778 .4783 .4788 .4793 .4798 .4803 .4808 .4812 .4812 2.1 .4821 .4826 .4830 .4834 .4838 .4842 .4846 .4850 .4854 .4857 2.2 .4861 .4864 .4868 .4871 .4875 .4878 .4881 .4884 .4887 .4896 2.3 .4893 .4896 .4898 .4901 .4904 .4906 .4909 .4911 .4913 .4913 2.4 .4918 .4920 .4922 .4925 .4927 .4929 .4931 .4932 .4934 .4936 2.5 .4938 .4940 .4941 .4943 .4945 .4946 .4948 .4949 .4951 .4955 2.6 .4953	1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.9 A713 A719 A726 A732 A738 A744 A750 A756 A761 A76 2.0 A772 A778 A783 A788 A793 A798 A803 A808 A812 A81 2.1 A821 A826 A830 A834 A838 A842 A846 A850 A854 A85 2.2 A861 A864 A868 A871 A875 A878 A881 A884 A887 A89 2.3 A893 A896 A898 A901 A904 A906 A909 A911 A913 A913 2.4 A918 A920 A922 A925 A927 A929 A931 A932 A934 A93 2.5 A938 A940 A941 A943 A945 A946 A948 A949 A951 A955 2.6 A953 A955 A956 A957 A959 A960 A961 A962 A963 A96 2.7 A965 A966 A967 A968 A969 <t< td=""><td>1.7</td><td>.4554</td><td>.4564</td><td>.4573</td><td>.4582</td><td>.4591</td><td>.4599</td><td>.4608</td><td>.4616</td><td>.4625</td><td>.4633</td></t<>	1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
2.0 4772 .4778 .4783 .4788 .4793 .4798 .4803 .4808 .4812 .481 2.1 .4821 .4826 .4830 .4834 .4838 .4842 .4846 .4850 .4854 .485 2.2 .4861 .4864 .4868 .4871 .4875 .4878 .4881 .4884 .4887 .4896 2.3 .4893 .4896 .4898 .4901 .4904 .4906 .4909 .4911 .4913 .4913 .4914 2.4 .4918 .4920 .4922 .4925 .4927 .4929 .4931 .4932 .4934 .4936 2.5 .4938 .4940 .4941 .4943 .4945 .4946 .4948 .4949 .4951 .4955 2.6 .4953 .4955 .4956 .4957 .4959 .4960 .4961 .4962 .4963 .496 2.7 .4965 .4966 .4967 .4968 .4969 .4970 .4971 .4972 .4973 .4976 2.8	1.8	.4641	.4649	4656	.4664	.4671	.4678	.4686	.4693	.4699	.4.706
2.1 .4821 .4826 .4830 .4834 .4838 .4842 .4846 .4850 .4854 .4852 2.2 .4861 .4864 .4868 .4871 .4875 .4878 .4881 .4884 .4887 .4896 2.3 .4893 .4896 .4898 .4901 .4904 .4906 .4909 .4911 .4913 .4913 .4913 .4914 .4913 .4927 .4929 .4931 .4932 .4934 .4936 2.5 .4938 .4940 .4941 .4943 .4945 .4946 .4948 .4949 .4951 .4955 2.6 .4953 .4955 .4956 .4957 .4959 .4960 .4961 .4962 .4963 .4966 2.7 .4965 .4966 .4967 .4968 .4969 .4970 .4971 .4972 .4973 .4976 2.8 .4974 .4975 .4976 .4977 .4978 .4979 .4979 .4980 .4986 2.9 .4981 .4982 .4982 .4983 .4984 <td>1.9</td> <td>.4713</td> <td>.4719</td> <td>.4726</td> <td>.4732</td> <td>.4738</td> <td>.4744</td> <td>.4750</td> <td>.4756</td> <td>.4761</td> <td>.4767</td>	1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.2 4861 .4864 .4868 .4871 .4875 .4878 .4881 .4884 .4887 .4896 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 .4955 2.6 .4953 .4955 .4956 .4957 .4959 .4960 .4961 .4962 .4963 .496 2.7 .4965 .4966 .4967 .4968 .4969 .4970 .4971 .4972 .4973 .4976 2.8 .4974 .4975 .4976 .4977 .4978 .4979 .4979 .4980 .498 2.9 .4981 .4982 .4983 .4984 .4984 .4985 .4985 .4986 .4986 .4986	2.0	.4772	.4778	4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.3 .4893 .4896 .4898 .4901 .4904 .4906 .4909 .4911 .4913 .4916 2.4 .4918 .4920 .4922 .4925 .4927 .4929 .4931 .4932 .4934 .4934 2.5 .4938 .4940 .4941 .4943 .4945 .4946 .4948 .4949 .4951 .4952 2.6 .4953 .4955 .4956 .4957 .4959 .4960 .4961 .4962 .4963 .496 2.7 .4965 .4966 .4967 .4968 .4969 .4970 .4971 .4972 .4973 .4974 2.8 .4974 .4975 .4976 .4977 .4977 .4978 .4979 .4980 .498 2.9 .4981 .4982 .4983 .4984 .4984 .4985 .4985 .4986 .4986	2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.4 .4918 .4920 .4922 .4925 .4927 .4929 .4931 .4932 .4934 .4936 2.5 .4938 .4940 .4941 .4943 .4945 .4946 .4948 .4949 .4951 .4955 2.6 .4953 .4955 .4956 .4957 .4959 .4960 .4961 .4962 .4963 .4966 2.7 .4965 .4966 .4967 .4968 .4969 .4970 .4971 .4972 .4973 .4976 2.8 .4974 .4975 .4976 .4977 .4977 .4978 .4979 .4979 .4980 .498 2.9 .4981 .4982 .4983 .4984 .4984 .4985 .4985 .4986 .4986	2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.5 .4938 .4940 .4941 .4943 .4945 .4946 .4948 .4949 .4951 .4952 2.6 .4953 .4955 .4956 .4957 .4959 .4960 .4961 .4962 .4963 .4966 2.7 .4965 .4966 .4967 .4968 .4969 .4970 .4971 .4972 .4973 .4972 2.8 .4974 .4975 .4976 .4977 .4978 .4979 .4979 .4980 .498 2.9 .4981 .4982 .4983 .4984 .4984 .4985 .4985 .4986 .4986 .4986	2.3	4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.6 .4953 .4955 .4956 .4957 .4959 .4960 .4961 .4962 .4963 .4966 2.7 .4965 .4966 .4967 .4968 .4969 .4970 .4971 .4972 .4973 .4973 2.8 .4974 .4975 .4976 .4977 .4977 .4978 .4979 .4979 .4980 .498 2.9 .4981 .4982 .4983 .4984 .4984 .4985 .4985 .4986 .4986	2.4	.4918	4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.7 .4965 .4966 .4967 .4968 .4969 .4970 .4971 .4972 .4973 .4974 2.8 .4974 .4975 .4976 .4977 .4977 .4978 .4979 .4979 .4980 .498 2.9 .4981 .4982 .4983 .4984 .4984 .4985 .4985 .4986 .4986	2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.8 .4974 .4975 .4976 .4977 .4977 .4978 .4979 .4979 .4980 .498 2.9 .4981 .4982 .4983 .4984 .4984 .4985 .4985 .4986 .4986	2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.9 .4981 .4982 .4982 .4983 .4984 .4984 .4985 .4985 .4986 .4986	2.7	.4965	.4966	.4967	.4968	.4969		.4971			.4974
	2.8	.4974									.4981
3.0 .4987 .4987 .4988 .4988 .4989 .4989 .4989 .4990 .4990	2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
	3.0	.4987	.4987	.4987	.4988	4988	.4989	.4989	.4989	.4990	.4990

Note: Use 0.4999 for ϵ values above 3.09.

Source: Frederick Mosteller and Robert E. K. Rourke, Sturdy Statistics, Table A-1 (Reading, Mass.: Addison-Wesley, 1973). Reprinted with permission of the copyright owners.

Area given in table