

DEPARTMENT OF STATISTICS AND DEMOGRAPHY

MAIN EXAMINATION, 2015/16

COURSE TITLE: INTRODUCTION TO STATISTICS

COURSE CODE: STA 141

TIME ALLOWED: TWO (2) HOURS

**INSTRUCTION: ANSWER ONE QUESTION IN SECTION A AND ANY TWO
QUESTIONS IN SECTION B
ALL QUESTIONS CARRY EQUAL MARKS (25 MARKS)**

SPECIAL REQUIREMENTS: SCIENTIFIC CALCULATORS AND STATISTICAL TABLES

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INVIGILATOR**

SECTION A

Question 1

In a factory, the time during working hours in which a machine is not operating as a result of breakage or failure is called the ‘downtime’. The following distribution shows a sample of 100 downtimes of a certain machine (rounded to the nearest minute):

Downtime	Frequencies
0 – 9	3
10 – 19	13
20 – 29	30
30 – 39	25
40 – 49	14
50 – 59	8
60 – 69	4
70 – 79	2
80 – 89	1

With reference to the above distribution, calculate

- (a) the mean.
- (b) the standard deviation.
- (c) the median.
- (d) the quartiles Q1 and Q3.
- (f) the modal downtime of the distribution

(25 marks)

Question 2

(a) The following scores represent the final examination grade for an economics course:

23	60	79	32	57	74	52	70	82	36	80	77	81	95
41	65	92	85	55	76	52	10	64	75	78	25	80	98
81	67	41	71	83	54	64	72	88	62	74	43	60	78
89	76	84	48	84	90	15	79	34	67	17	82	69	74

Using 10 class intervals with the lowest starting at 9:

- (i) Set up a frequency distribution and a cumulative frequency distribution.

(10 marks)

(b) A random sample of 11 vouchers is taken from a corporate expense account. The Voucher amounts are as follows:

\$276.72	194.17	259.83	249.45
201.43	237.66	199.28	211.49
240.16	261.10	226.21	

Compute:

- (i) the range and the inter-quartile range;
- (ii) the variance and standard deviation;
- (iii) the coefficient of variation.

(2+10+3 marks)

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.

Major	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:
- happy with the choice of major
 - a Psychology major
 - a Communications major given that the student is happy with the choice of major
 - unhappy with the choice of major given that the student is a Psychology major
 - a Psychology major and is happy with that major
 - 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.
(2+2+4+4+4+4+5 marks)

Question 4

(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:

- Exactly two of them provide retirement benefits to their employees.
- None of them provides retirement benefits to their employees.
- At most one of them provides retirement. (3+3+4 marks)

(b) An average of 5 customers come to the First National Bank every half hour.

- Find the probability that exactly two customers will come to this bank during a given hour.
- Find the probability that during a given hour, the number of customers who will come to this bank is **Fewer than five**
- Find the probability that during a given hour, the number of customers who will come to this bank is **Five or more** (3+3+2 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:

- Less than 43
- Greater than 74
- Between 56 and 71 (2+2+3 marks)

Question 5

Page 4 of 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) **(8 marks)**

(c) In a cannery, assembly lines I, II, III account for 50, 30 and 20 percent of the total output. If 0.4 percent of the cans from assembly line I are improperly sealed, and the corresponding percentages of assembly lines II and III are 0.6 percent and 1.2 percent respectively, what is the probability that an improperly sealed can discovered at the final inspection of outgoing products would have come from assembly line I? **(10 marks)**

END OF EXAM!!

