

**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**FACULTY OF THE BUILT ENVIRONMENT**

**DEPARTMENT OF LANDSCAPE ARCHITECTURE AND URBAN DESIGN**

**BSc HONOURS IN PROPERTY DEVELOPMENT AND ESTATE MANAGEMENT**

**AQS 2209: STATISTICS I**

SEPTEMBER 2014 EXAMINATION

Time: 3 hours

Candidates should answer **ONLY FOUR** questions (25 marks each).

Statistical Tables are provided; however, Statistical Tables should not be marked or taken out of the examination room.

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A1. (a) A property management firm researched on 2000 community members about home ownership and owning a car so as to improve the residential properties on car pots. The following results were obtained:

Owning a car	Homeowner	Renter	Total
Yes	824	681	1505
No	176	319	495
Total	1000	1000	2000

- (i) find the probability that someone who drives to work is a homeowner, [2]
- (ii) find the probability that a homeowner drives to work, [2]
- (iii) find the probability of renting given owning a car [2]
- (iv) Define random experiment and explain its importance. [5]

(b) A box contains 40 air vanes for renovating the driveway at a property managed by a real estate company. Six of the air vanes are defective. Two air vanes are selected at random without replacement. What is the probability that:

- (i) Both are defective [2]
- (ii) One is defective [2]
- (iii) None is defective [2]

(c) Prove the De Morgan's laws

(i)  $(A \cup B)' = A' \cap B'$ .

(ii)  $(A \cap B)' = A' \cup B'$ .

[8]

**A2.**

(a) A discrete probability distribution function is given below:

X	1	2	3	4
P(X=x)	0.1	0.4	0.2	0.3

- (i) Find  $E[X]$  [3]  
 (ii) Find  $\text{var}[X]$  [5]

(b) The time (in minutes) until the next customer enter into a property firm follows a uniform distribution with  $f(x) = \frac{1}{20}$  where  $x$  goes from 25 to 45 minutes.

- (i) Find  $E[X]$  [3]  
 (ii) Find  $\text{var}[X]$  [5]  
 (iii) Find the probability that the time is greater than 30 [3]

(c) With reference to examples, compare discrete and continuous distributions [6]

**A3.** a) Ten percent of the properties under lease by a real estate company are in bad state and needs renovations. Find the probability that out of 10 properties selected,

- (i) 6 are in bad state. [2]  
 (ii) At least 4 properties need renovations. [5]  
 (iii) At most 8 properties are in bad state. [4]  
 (iv) Find the mean and variance of properties in bad state from a sample of 200. [4]

b) The audit reports at a property management firm found out that 2.5% of all invoices contain errors.

- (i) What are the conditions for using Poisson approximation to binomial distribution? [4]  
 (ii) What is the chance that a random sample of 100 invoices 4 or more incorrect invoices? [6]

**A4.** (a) State any four properties of the normal distribution [5]

(b) The mean weight of packed driveway pavers is 150kg and the standard deviation is 15kg. Assuming the weights are normally distributed what proportion of the packs weigh:

- (i) Between 125 and 160kg. [5]  
 (ii) More than 185kg [5]  
 (iii) Less than 130kg [5]  
 (iv) From a proportion of 500 packs of the pavers, how many packs have a weight between 150 and 180kg [5]

**A5.** (a) Explain using examples the terms type 1 and type 11 errors as they are used in hypothesis testing. [5]

(b) The following table shows information about the complaints received by two property management firms for valuations done in 2013.

	Company A	Company B
Sample Mean	25	19
Standard deviation	2	3.5
Sample size	10	9

(i) Assuming population variances are not known, test at 5% level of significance if there is any difference in the complaints between the property management firms. [10]

(ii) Construct a 95% confidence interval of the means of company A and company. [10]