TECHNICAL UNIVERSITY OF MOMBASA
Faculty of Business and Social Studies

DEPARTMENT OF BUSINESS STUDIES

UNIVERSITY EXAMINATIONS FOR DEGREE IN
BACHELOR OF BUSINESS ADMINISTRATION
BACHELOR OF COMMERCE

BMS 4203: ADVANCED BUSINESS STATISTICS

END OF SEMESTER EXAMINATIONS
SERIES: APRIL 2015
TIME: 2 HOURS

INSTRUCTIONS:

– Answer Question **ONE (Compulsory)** and any other **TWO** questions.
– Do not write on the question paper

This paper consists of Three printed pages

QUESTION 1 (Compulsory)

a) Describe the following terms; with examples:
   i) Random variable   **(1 mark)**
   ii) Discrete random variable   **(2 marks)**
   iii) Continuous random variable   **(2 marks)**

b) When a new machine is function properly, only 3% of the items produced are defective. Assume that we will randomly select two parts produced on the machine and that we are interested in the number of defective parts found.
   i) Describe the conditions under which this situation would be a binomial experiment.   **(2 marks)**
   ii) Draw a tree diagram showing this problem as a two-trial experiment.   **(4 marks)**
   iii) How many experimental outcomes result in exactly one defect being found?   **(2 marks)**
   iv) Compute the probabilities associated with finding no defect, exactly one defect, and two defects.

                                                                                           (6 marks)

---

c) i) The hypergeometric probability distribution is closely related to the binomial distribution. The two distribution differ in two key ways. Explain. **(3 marks)**

ii) Electrical fuses produced by Kenyan Electric are packed in boxes of 12 units each. Suppose an inspector randomly selects three of the 12 fuses in a box for testing. If the box contains exactly five defective fuses, what is the probability of finding exactly one of the three fuses defective? What is the probability of finding at least 1 defective fuse. **(8 marks)**

QUESTION 2

A binomial probability distribution has $P = 0.20$ and $n = 100$

a) What is the mean and standard deviation? **(4 marks)**

b) Can you use a normal distribution to approximate the binomial distributed? Explain. **(2 marks)**

c) What is the probability of exactly 24 successes? **(5 marks)**

d) What is the probability of 18 to 22 successes? **(4 marks)**

e) What is the probability of 15 or fewer successes? Draw diagrams to explain your working. **(4 marks)**

QUESTION 3

a) Five observations taken for two variables follow:

X_i	4	6	11	3	16
Y_i	5	50	40	60	30

Draw a scatter graph, and briefly explain the relationship between the two variables. **(5 marks)**

b) Compute and interpret the sample covariance. **(8 marks)**

c) Compute and interpret the sample correlation coefficient. **(7 marks)**

QUESTION 4

a) Give **FOUR** assumptions for the two-way ANOVA. **(4 marks)**

b) A researcher wishes to see whether the type of gasoline used and the type of automobile driven have any effect on gasoline consumption. Two types of gasoline, regular (super) and diesel are used. The data is given on the following table.

Gasoline	Type of automobile	
	Two-wheel drive	Four-wheel-drive
Regular (super)	26.7	28.6
	25.2	29.3
Diesel	32.3	26.1
	32.8	24.2

Required:

Using $\alpha = 0.05$, carry out a two-way ANOVA.

(16 marks)

QUESTION 5

a) Different the following:
   i) Null and alternate hypothesis
   ii) Type I Error and Type II Error
   iii) One tailed and two-tailed **(6 marks)**

b) A researcher reports that the average salary of assistant lecturers is more than $42,000. A sample of 30 assistant lecturers has a mean salary of $43,260. At $\alpha = 0.05$, test the claim that assistant lecturers earn more than $42,000 a year. The standard deviation of the population is $5230.
(6 marks)

c) Ten alkalinity readings are made in the upper reaches of a river in the region and fifteen in the lower reaches of the same river with the following results:

Upper reaches	91	75	91	88	94	63	86	77	71	69
Lower reaches	86	95	68	79	62	85	97	113	121	121
	135	143	108	108	64					

Required:
Investigate, at the 1% level of significance, the claim that the true mean alkalinity of water in the lower reaches of this river is greater than that in the upper reaches. **(8 marks)**