FACULTY: BASIC AND APPLIED SCIENCES
DEPARTMENT: MATHEMATICS AND COMPUTER SCIENCE
SEMESTER I EXAMINATIONS (2017)
2016 / 2017 ACADEMIC SESSION

COURSE CODE: MTH 333

COURSE TITLE: STASTISTICS FOR SCIENCE AND ENGINEERING

DURATION: 2 Hours

HOD's SIGNATURE

INSTRUCTIONS:

1. YOU ARE TO ANSWER **FOUR** QUESTIONS OUT OF **SIX**
2. SEVERE PENALTIES APPLY FOR MISCONDUCT,CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING THE EXAM
3. YOU ARE NOT ALLOWED TO BORROW CALCULATORS AND WRITING MATERIALS

Q1. A mathematics lecturer recorded the length of time, y – minutes, taken to travel to school when leaving home x – minutes after 7a. m on seven (7) selected mornings .The results are as follows.

$$x \quad 0 \quad 10 \quad 20 \quad 30 \quad 40 \quad 50 \quad 60$$

$$y \quad 16 \quad 27 \quad 28 \quad 39 \quad 39 \quad 48 \quad 51.$$

(i)   Plot the diagram on a scatter diagram.   **(3MARKS)**
(ii)   Calculate the equation of the least squares regression line of y on x, writing your answer in the form $y = a + bx$.   **(6MARKS)**
(iii)   The mathematics lecturer, needs to arrive at school not later than 8.40a. m.The number ofminutes by which the mathematice lecturer arrives early at school, when leaving home x – minutes after 7a.m is denoted by Z.
Deduce that $Z = (100 - a) - (1 + b)x$.   **(3 MARKS)**
(iv)   Hence estimate, to the nearest minutes the latest time that the mathematics lecturer can leave home without then arriving late at school.   **(3 MARKS)**

Q2. (a) A police authority conducts an eight (8) week experiment. In each week it records the number of foot patrols, x, made in a small town and the number of reported crimes, y, in that town. The data are summarised as follows:

$$\sum x = 52, \qquad \sum x^2 = 380 \quad \sum xy = 1335, \qquad \sum y = 225, \qquad \sum y^2 = 7007, \quad n = 8.$$

Caculate the value of the product moment correlation coefficient for these data.   **($7\frac{1}{2}$ MARKS)**

(b) The table below shows the number of absences, x, in a calculus course and the final examination grade y, for seven (7) students.

$$x \quad 1 \quad 0 \quad 2 \quad 6 \quad 4 \quad 3 \quad 3$$

$$y \quad 95 \quad 90 \quad 90 \quad 55 \quad 70 \quad 80 \quad 85.$$

Find the correlation coefficient and interpret your result.   **($7\frac{1}{2}MARKS$)**

Q3. (a) State the central limit theorem.   **(2 MARKS)**

It is believed that 35% of people like fish and chips. A survey is conducted to verify this. Find the minimum number of people who should be surveyed if the expected number of people who like fish and chips is to exceed 60.   **(4 MARKS)**

(b) Find the area between (i) $z = 0.79 \; and \; z = 1.28$

(ii) $z = -2.16 \; and \; z = 0$

(iii) Find the area to the right of $z = -2.45$ **(3 MARKS)**

(c) The probability that an individual will suffer a bad reaction from injection of a given serum is 0.001, determine the probability that out of 2000 $individuals$ (i) $exactly$ 3 (ii) $more$ $than$ 2, individuals will suffer a bad reaction.

(6 MARKS)

Q4. (a) In a transportation study, 20 cities were radonmly selected from all cities having a population of $50,000$ or more, the number of cars per 1000 people was determined for each selected city and the results are shown below

$$409, 487, 480, 535, 663, 676, 494,$$

$$332, 304, 565, 670, 434, 535, 554,$$

$$515, 665, 628, 308, 319, 519$$

Find a 95% confidence interval for μ, $where$ μ, is the mean number of cars per 1000 people for all cities having a population of 50,000 or $more$. what assumption is necessary for the confidence interval to be valid.

(9 MARKS)

(b) Define the following terms: (i) Population Parameters (ii) Statistic (iii) Confidence Interval

(6MARKS)

Q5. (a) The average daily jail population in a particular city is $618,319$, if the population is normal and the standard deviation is $50,200$. Find the probability that on a randomly selected day , the jail population is (i) greater than $700,000$ (ii) $between$ $500,000$ and $600,000$.($6\frac{1}{2}$MARKS)

(b) Twenty (20) wrist watches in a box of 100 are defective. If ten (10) watches are selected at random. Find the probability that (i) 10 are $defective$

(ii) 10 are $good$ (iii) at least one watch is defective (iv) atmost 3 are $defective$.

($8\frac{1}{2}MARKS$)

Q6. (a) Define the following concepts: (i) Hypothesis Testing (ii) Type I error

(iii) Type II error.

(6 MARKS)

(b) The average earnings of 100 $male$ $lecturers$ is $N37,600$ with standard deviation $N12,000$. The average earning of 50 $female$ $lecturers$ is $N36,900$ and $standard$ deviation is $N10,000$.

Test the hypothesis at a significance level of 5% that the average salary of male lecturers and female lecturers are equal. [Hint: At significance level of 5% we have 1.96 as critical value]

(9 MARKS)