MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST YEAR SECOND SEMESTER EXAMINATION FOR DEGREE IN
BACHELOR OF SCIENCE IN HOSPITALITY AND TOURISM MANAGEMENT

HTM 205: PROBABILITY AND STATISTICS

DATE: 30/5/2017   **TIME: 8:30 – 10:30 AM**

INSTRUCTIONS

1. **Answer Question 1 and any other two questions.**
2. **You must have the following items for this paper:**
   - **Statistical tables.**
   - **Scientific calculator.**

1. (a) Differentiate between each of the following terms as used in Statistics.

    (i)   primary data and secondary data;
    (ii) categorical data and numerical data.   (6 marks)

   (b) Explain in words the meaning of each of the following terms as used in Statistics:

    (i)   mean;
    (ii) median.   (4 marks)

   (c) The data given below represents the frequency distribution of sizes of shoes purchased by 250 customers in the month of December 2016.

Shoe size	4	5	6	7	8	9	10	11
No. of customers	6	16	42	64	52	36	24	10

   Determine each of the following measures about the distribution the sizes:

    (i)   Median;
    (ii) Mean;
    (iii) Standard deviation.   (9 marks)

(d) An nutritional scientist carried out a study on the relationship between the monthly income of a person and the price of food consumed at one sitting in a restaurant on a certain day. The coefficient of correlation between the two variables was computed and found to be $r = 0.7864$

Compute the co-efficient of determination between the monthly income of a person and the price of food consumed, and interpret the result obtained. (5 marks)

(e) A box contains 8 blue pens and 4 black pens which are identical in all aspects except colour. A customer picks 2 pens at random from the box one at a time without replacement.

(i) Present this information using a probability tree diagram. (3 marks)

(ii) Hence determine the probability that all the pens picked are of different colours.(3 marks)

2. The table below shows the age distribution of 500 employees working at the headquarters of a county government.

Age (years)	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64
No. of employees	6	20	74	96	120	92	64	24	4

(a) Estimate by calculation each of the following measures about the age of the employees.

i) Mean
ii) Median
iii) Standard deviation (8 marks)

(b) Due to continuous burden of the huge wage bill, it is desired to reduce the present number of employees according to the following scheme:

- To retrain the first 15% from the lower age group.
- To retain the next 45% in their current workstations.
- To transfer the next 30% to the national government.
- To retrench the 10% from the highest age group.

Determine the age limits of the persons retained and those to be transferred to the national government. (7 marks)

(c) Suppose the employees whose age is between 42 and 52 years are to be transferred to the national government. Determine the proportion of employees who will be transferred. (5 marks)

3. A researcher in the hotel industry is interested in investigating the relationship between the distance a hotel is from the city centre and the rate paid for a room per night in the Coast region. A survey was carried out in which a random sample of 10 hotels was taken and the distance a hotel is from the city centre in kilometres and the rate paid for a room per night in thousand Kenya shillings recorded as shown below.

Hotel	A	B	C	D	E	F	G	H	J	K
Distance	24.6	18.8	15.2	12.5	24.2	32.0	17.4	26.2	15.4	13.8
Rate	32	26	24	20	28	35	30	36	21	12

(a) (i)   Compute the Pearson's product moment co-efficient of correlation between the distance from the city centre and the rate paid for a room per night.   (9 marks)

(ii) Interpret the result obtained in (a) (i) above.   (2 marks)

(b) (i)   Determine the least squares regression line of the rate paid for a room per night on the distance from the city centre.   (4 marks)

(ii) Interpret the regression line obtained in (b) (i) above.   (3 marks)

(iii) Using the regression line obtained in (b)(i) above, estimate by calculation the rate paid for a room per night in a typical hotel which is 20 kilometres away from the city centre.
          (2 marks)

4. (a)   A landline phone number system in Nairobi uses 10 digits to assign phone numbers to its subscribers. However, the first three digits must be a 0 (zero), 2 and 0 in that order, while the, the fourth digit must not be a 0 (zero). Determine the maximum number of subscribers which can be accommodated by this coding system.   (4 marks)

(b)   A market survey was conducted on the popularity of the watching of news on the main television channels in rural Kenya. A random sample of 520 rural residents was taken from some counties and the findings of TV viewing on a certain day were as follows:

- 276 residents watched Nation
- 260 residents watched KTN
- 228 residents watched Citizen
- 120 residents watched Nation and KTN
- 108 residents watched Nation and Citizen
- 104 residents watched KTN and Citizen
- 40 residents did not watch any of the three TV channels

(i)   Present this information in a Venn diagram.   (6 marks)

(ii) Determine the number of residents in the study who watched:

I.   exactly two of the TV channels;
II. Nation or KTN but not Citizen.   (4 marks)

(c) There is an outbreak of a certain mysterious disease in a certain area. This disease has a known symptom. However, doctors realised that not all people who have the disease display the symptom and not all those who display the symptom have the disease. After conducting a medical survey among a random sample of 360 residents in the area, the findings were as follows:

- 144 patients who displayed the symptom had the disease;
- 96 patients who displayed the symptom did not have the disease;
- 48 patients who had the disease did not display the symptom;
- 72 patients did not have the disease and did not display the symptom;

(i) Present this information in a contingency table.

(ii) A patient who has the disease is selected at random from the area, determine the probability that he displays the symptom.

(iii) A patient who displays the symptom is selected at random from the area, determine the probability that he has the disease. (6 marks)

5. (a) Outline **three** properties of the binomial probability distribution. (3 marks)

(b) A restaurant manager claims that 40% of the customers in Machakos prefer sitting in open air places. Assuming that this claim is true, determine the probability that among 12 such customers randomly selected from Machakos, the following would prefer sitting in open air places:

(i) between 4 and 6 customers inclusive;

(ii) at least 3 customers. (7 marks)

(c) The operational lifespan of a given brand of a laundry machine has been found to be normally distributed with a mean of 4.8 years and a standard deviation of 1.6 years.

(i) Determine the proportion of these laundry machines that will have a lifespan of between 3.8 years and 6.6 years; (4 marks)

(ii) If these laundry machines have a warranty period of 2 years, determine the proportion of original sales which will require replacement through this warranty. (3 marks)

(iii) If the manufacturer of these laundry machines wants only 5% of the machines to be replaced through this warranty, determine the warranty period that should be set to achieve this. (3 marks)