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MAIN EXAMINATION

MAY – JULY 2019 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS AND ACTUARIAL SCIENCE

SPECIAL / SUPPLEMENTARY EXAMINATION

MAT 262: PROBABILITY AND STATISTICS

Date: JULY 2019

Duration: 2 Hours

INSTRUCTIONS: Answer Question ONE and any other TWO Questions

Q1. a) State three advantages and three disadvantages of the postal questionnaire as a means of data collection. **(6marks)**

b) A discrete random variable has a pmf given by the table below.

x	0	1	2	3	4
$P(X=x)$	k	2k	5k	10k	17k

Find the value of the constant k. hence compute $p(1 \leq x < 3)$

(5marks)

c) Describe briefly the following frequency distribution diagrams. **(3marks)**

- I. Pictograms
- II. Bar charts
- III. Pie charts

d) Construct an ungrouped frequency table for the data below. **(3marks)**

16 14 15 13 12 14 16 15 15 14 17 16 13 16 15 14 18 13 15 17

e) A continuous random variable x has pdf given by

$$f(x) = \begin{cases} 0.5x, & 0 \leq x \leq 2 \\ 0, & \text{elsewhere} \end{cases}$$

Find the mean and standard deviation of x

(5marks)

- f) The following data relates to the number of successful sales made by the salesmen employed by a large microcomputer firm in a particular quarter.

Number of sales	0-4	5-9	10-14	15-19	20-24	25-29
Number of salesmen	1	14	23	21	15	6

Calculate the mean number of sales. **(4marks)**

- g) Two tetrahedral dice are rolled together once and the sum of the scores facing down was noted. Find the pmf of the random variable 'the sum of the scores facing down' **(4marks)**

- Q2. a) A machine can produce $2000(\pm 25)$ items per day, each of which can weigh between 5 and 7 grammes. At the end of each day, the production from eight similar machines is loaded into at least 10 (but not more than 15) equally weighted shipping crates. Find the lower and upper limits of the weight of one loaded crate (to the nearest gramme). **(9marks)**

- b) Customers arrive at a checkout counter according to a Poisson distribution at an average of 7 per hour. During a given hour, what are the probabilities that:
- i) No more than 3 customers arrive **(5marks)**
 - ii) At least 2 customers arrive **(4marks)**
 - iii) Exactly 5 customers arrive **(2marks)**

- Q3. a) Estimate the mode and median of the following distribution of ages. **(8marks)**

Age(years)	20-25	25-30	30-35	35-40	40-45	45-50
Number of employees	2	14	29	43	33	9

- b) A firm is independently working on two separate jobs. There is a probability of only 0.3 that either job will be finished on time. Find the probability that:
- i. Both jobs will be finished on time **(2marks)**
 - ii Neither of the jobs will be finished on time **(2marks)**
 - iii Just one job is finished on time **(3marks)**
 - iv At least one job is finished on time **(2marks)**

- c) State any three characteristics of the mode. **(3marks)**

- Q4. a) From past records, the probability that a machine will need correcting adjustments during a day's production run is 0.2. If there are 6 of these machines running on a particular day, find the probability that:

- i) No machines need correcting **(3marks)**
- ii) Just one machine needs correcting **(3marks)**
- iii) Exactly two machines need correcting **(3marks)**
- iv) More than two machines need correcting **(5marks)**

- b) Items produced from a machine are known to be 1% defective. If the items are boxed into lots of 200, what is the probability of finding that a single box has 2 or more defectives? **(6marks)**

Q5. a) Weights of bags of potatoes are normally distributed with mean 5 lbs and standard deviation 0.2 lbs. The potatoes are delivered

i) What is the probability that a random bag will weigh more than 5.5 lbs?

(4marks)

ii) How many bags, from a single delivery, would be expected to weigh more than 5.5 lbs?. **(2marks)**

b) Analysis of questionnaire completed by holiday makers showed that 0.75 classified their holiday as good at Costa Lotta. The probability of hot weather in the resort is 0.6. If the probability of regarding the holiday as good given hot weather is 0.9, what is the probability that there was hot weather if a holiday maker considers his holiday good? **(6 marks)**

- c) Records show that 60% of students pass their examinations at the first attempt. Using the normal approximation to the binomial, calculate the probability that at least 65% of a group of 200 students will pass at their first attempt. **(8 marks)**

END