Mount Kenya University

UNIVERSITY EXAMINATION 2012/2013

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF NATURAL SCIENCES

BACHELORS IN EDUCATION SCIENCE

SCHOOL BASED

UNIT CODE: BMA 222 JNIT TITLE: PROBABILITY & STATISTICS II

DATE: MARCH 2013 MAIN EXAM TIME:2HRS

Answer Question One and any other Two Questions.

1. An athlete believes that her times for running 200 meters in races are normally distributed with a mean of 22.8 seconds.
   a) Given that ~~his~~ her time is over 23.3 seconds in 20% of her races, calculate the variance of her times. 4 mks
   b) The record over this distance for women at her club is 21.82 seconds, According to his model, what is the chance that she will beat this record in her next race? 3 mks

   A golfer believes that the distance, in meters, that she hits a ball with a siron, follows a continuous uniform distribution over the interval [100,150]

   c) Find the median and interquartile range of the distance she hits a ball, that would be predicted by this model. 3 mks
   d) Explain why the continuous uniform distribution may not be a suitable model. 2 mks

   The continuous random variable x has the following cumulative distribution function:

$$F(x) = \begin{cases} 0 & x < 0 \\ \frac{1}{64}(16x - x^2), & 0 \le x \le 8 \\ 1 & x > 8 \end{cases}$$

$\frac{1}{64}(16-x)$

$16\times 8 - 8^2$ $16\times 5 - 5^2$ $16\times 2 - 4$ $16\times 3 - 4^3$

128 $16\times 6 - 6^2$ $= 32 - 4$ $48 - 64$ $64 - 4$

$16\times 4 - 4^2$ $16\times 7 - 7^2$ $16\times 3 - 3^2$ $= 48 - 9.$

2.71828 $\int_0^{t} 1/64(16t-t^2)dt$ 7/2 $e^{-7/2} = \frac{1}{e^{9/2}} = \frac{1}{(\sqrt{2.1})^9}$

$1/64\left(\frac{16t^2}{2} - \frac{t^3}{3}\right)$

$1/64 \; \frac{x^2}{2} - \frac{x^3}{3} - [512 - 170.66$

$= 1/64(8x^2 - \frac{x^3}{3} -$

e) Find $P(x > 5)$ 2 mks

f) Find and specify fully the probability density function f(x) of X. 3 mks

g) Sketch f(x) for all values of x. 2 mks

h) Find the moment generating function of f (x) 3 mks

An electrician records the number of repairs of different types of appliances that he makes each day. His records show that over 40 working days he repaired a total of 180 CD players. 40 day → 180 cd players

uniform distribution, randomness, independence

i) Explain why a poisson distribution may be suitable for modeling the numbers of CD players he repairs each day and find the parameter for this distribution. 3 mks

j) Find the probability that on one particular day he repairs
   i. No CD players. $P=0$
   ii. More than 4 CD players. $P\ x>4$ 2 mks

k) Find the probability that over 10 working days he will repair more than 5 CD players on exactly 3 of the days. 2 mks

2. The continuous random variable T has the following probability density function:

$$f(t) = \begin{cases} K(t^2 + 2t), & 0 \le t \le 3 \\ 0, & \text{Otherwise} \end{cases}$$

4.48

a) Show that $K = \frac{1}{15}$ 2 mks

$(\sqrt{2.71828})^9$ $(1.64)^3$ $\frac{1}{89.95}$

b) Sketch f(t) for all values of t 2 mks

c) State the mode of T 1 mk

d) Find E (T) $t(ta)$ 3 mks

e) Show that the standard deviation of T is 0.798 correct to 3 significant figures. 4 mks

A shop receives weekly deliveries of 120 eggs from a local farm. The proportion of eggs, received from the farm that is broken is 0.008.

q 0.992 0.10

f) Explain why it is reasonable to use the binomial distribution to model the numbers of eggs that are broken in each delivery. 2 mks

g) Use the binomial distribution to calculate the probability that at most one egg in a delivery will be broken. 3 mks

h) Using the poisson approximation to binomial, Find the probability that at most one egg in a delivery will be broken. Comment on your answer. 3 mks

$= x=0 + x=1$

3. The length of time, in tens of minutes, that patients spend waiting at a doctors surgery is modeled by the continuous random variable T, with the following cumulative distribution:

$\frac{1}{(2.71828)}$ 1000 1000 ~~99~~ 0.992 0.008 1.000

$\frac{1}{20.085}$