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Knowledge for Development

UNIVERSITY EXAMINATIONS

2013/2014 ACADEMIC YEAR

1ST YEAR 2ND SEMESTER EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF EDUCATION

COURSE CODE: STA 142

COURSE TITLE: INTRODUCTION TO PROBABILITY

DATE: 18TH AUGUST, 2014 **TIME: 9.00 A.M. – 12 NOON**

Instructions to candidates: Answer **Question one** and any other **two** questions

Question one (30 Marks)

a) Paul, Joe and Ken are playing soccer. The probability that Paul scores a goal is $\frac{1}{4}$, that of Joe scoring a goal is $\frac{3}{5}$ and that of Ken scoring is $\frac{4}{7}$. Find the probability that in a soccer game

i) Only one scores a goal (8mks)

ii) None of them scores a goal (2mks)

iii) All of them score (2mks)

iv) Two of them score (8mks)

v) At least one scores (2mks)

b) i) State Baye's theorem. (2mks)

ii) A letter is equally likely to be found in one of the three folders on the table. Let α_i be the probability that a quick search of pot i, i=1,2,3, reveals the letter if the letter is in fact there. A quick search of folder 3 does not reveal the letter. What is the probability that the letter is in folder 3? (6mks)

Question two (20 Marks)

a) What is conditional probability? (2mks)

b) In a certain company, employees are graded 1-4 as well as in terms of gender as follows:

	Grade			
	1	2	3	4
Male	0.35	0.12	0.08	0.03
Female	0.25	0.08	0.07	0.02

The entries refer to probabilities. Determine the probability that an employee selected at random will be

i) Female (3mks)

ii) Of grade 1 given that he is male (3mks)

iii) Grade 1 employee or grade 2 female (3mks)

c) A continuous random variable X has pdf f(x) given by

$$f(x) = \begin{cases} k(x^3 + x), & 0 < x < 2 \\ 0, & elsewhere \end{cases}$$

i) Determine the value of k (3mks)

ii) Find the expected value and variance of X (6mks)

Question three (20 Marks)

a) The probability that Anne goes to the show is $\frac{1}{3}$. If she goes to the show the probability that she sees a python is $\frac{2}{5}$ and if she doesn't go to the show the probability that she sees a python is $\frac{1}{8}$. Find the probability that

   i) Anne goes to the show but doesn't see a python. (2mks)

   ii) Anne sees a python elsewhere. (2mks)

b) A team of four is chosen at random from five ladies and six men. In how many ways can the team be chosen if

   i) There are no restrictions (2mks)

   ii) There must be more girls than boys (6mks)

   iii) Find the probability that the team contains only one man (4mks)

c) Given that $P(A)^c = 0.47$, $P(B) = 0.72$ and $P(AnB) = 0.48$, compute

   i) $P(A)$ (1mk)

   ii) $P(B)^c$ (1mk)

   iii) $P(\overline{AUB})$ (2mks)

Question four (20 Marks)

a) A six-sided die has faces marked with numbers 1,3,5,7,9,11. It is biased so that the probability of obtaining the number, r, in a single roll of the die is proportional to R

   i) Show that the probability distribution of R is given by
   $P(R=r) = \frac{r}{36}$, r = 1,3,5,7,9,11 (5mks)

   ii) The die is to be rolled and a rectangle drawn with sides of lengths 6cm and Rcm. Calculate the expected value of the area of the rectangle. (5mks)

   iii) The die is to be rolled again and a square drawn with sides of length $24R^{-1}$cm. Calculate the expected value of the perimeter of the square. (5mks)

b) Distinguish between:

   i) A set and a subset (2mks)

   ii) Equal sets and equivalent sets (3mks)

Question five (20 Marks)

a) At a local shop in town, 60% of customers pay by credit card. Compute the probability that in a randomly selected sample of ten customers:

   i) Exactly two pay by credit card (3mks)

   ii) More than seven pay by credit card (5mks)

b) The heights of students at a college are normally distributed with mean height 150cm and standard deviation 10cm. Find the probability that the height of a randomly selected student lies is shorter than 165cm (5mks)

c) A tailor finds that on average the number of flaws in a one metre length of material is 4. Assuming that the number of flaws follows a poisson distribution, find the probability that in a one metre length material there are

i) Exactly five flaws (2mks)

ii) No flows (2mks)

iii) Fewer than three flaws (3mks)