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**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**SCHOOL OF MATHEMATICS AND ACTURIAL SCIENCE**

**UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE ACTURIAL**

**4th YEAR 1st SEMESTER 2015/2016 ACADEMIC YEAR**

**MAIN REGULAR**

**COURSE CODE: SAS 401**

**COURSE TITLE: FURTHER DISTRIBUTION THEORY**

**EXAM VENUE: STREAM: (Bsc. Actuarial Science)**

DATE: EXAM SESSION: SEP-DEC 2016

TIME: 2.00 HOURS

**Instructions:**

1. **Answer questions one and any other two.**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

**QUESTION ONE (30 MARKS)**

(a) Show that if and are two independent Poisson variates with parameters and respectively, then the conditional distribution of given is a binomial distribution. (5 marks)

(b) Given .

Find the distribution of (5 marks)

(c) The probability generating function of a random variable is given by

Find the probability function of . (5marks)

(d) Let be independent random variables. The probability function of () is

Find the probability generating function of and hence its probability functions. (5marks)

(e) Show that Normal distribution is a particular case of with *df*. (5 marks)

(f) Let be a random sample drawn from a population having density

Find the distribution of . Also, find the mean and variance of this distribution. (5 marks)

**QUESTION TWO(20 Marks)**

Four hundred samples of each of 1 c.c. of a liquid were investigated to study the number of Bacteriapresent in each sample. The maximum number of Bacteria was found 8 in the samples. Below is a given number of Bacteria in different samples

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of Bacteria (x) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Total |
| Number of samples (f) | 107 | 142 | 92 | 45 | 8 | 4 | 2 | 0 | 0 | 400 |

Fit a Poisson distribution using the above data. (20 marks)

**QUESTION THREE(20 Marks)**

Construct the following distributions using power series method

1. Poisson (5 marks)
2. Binomial (5 marks)

Hence obtain

1. Expectations (5 marks)
2. Variances (5 marks)

**QUESTION FOUR(20 Marks)**

1. Suppose the *pdf* of Gamma distribution with one parameter is

And the *pmf* of Poisson distribution provided by

1. Find mixed distribution of Poisson and Gamma (8 marks)
2. What is the resulting distribution from the mixture? (2 marks)
3. Assuming that a two parameter Gamma distribution
4. Show that the mixed Poisson distribution and the two parameter Gamma result to a negative binomial distribution. (10 marks)

**QUESTION FIVE(20 Marks)**

If and are two independent standard normal variates, find the distribution of

1. (7 marks)
2. (7 marks)
3. (6 marks)