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

**SCHOOL OF MATHEMATICS AND ACTUARIAL SCIENCE**

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

**2016/2017 ACADEMIC YEAR**

**YEAR ONE SEMESTER TWO**

**MAIN REGULAR**

**APRIL 2017 EXAMINATION**

**COURSE CODE: SAS 102**

**COURSE TITLE: PROBABILITY AND DISTRIBUTION THEORY 1**

**EXAM VENUE: STREAM: (BSc. Actuarial)**

DATE: EXAM SESSION:

TIME: 2.00 HOURS

**Instructions:**

1. **Answer question 1 (Compulsory) and ANY other 2 questions**
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 (COMPULSORY)-(30 MARKS)**

1. The joint density function of two continuous random variables X and Y is given by

Obtain

1. the value of .
2. the expected value of X (6marks)
3. Let

be the p.d.f. of two random variables *X* and *Y,* which must be of continuous type. Find

(6marks)

1. The joint probability function for two discrete random variables X and Y is tabulated as shown

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Y=0 | Y=1 | Y=2 | Y=3 |
| X=1 | 0.06 | 0.02 | 0.04 | 0.08 |
| X=2 | 0.15 | 0.05 | 0.10 | 0.20 |
| X=3 | 0.09 | 0.03 | 0.06 | 0.12 |

Determine

1. Marginal distributions of X and Y . (2marks)
2. P( X≤2, Y≥2) (2marks)
3. The failure of a circuit board interrupts work until a new board is delivered. The delivery time Y is uniformly distributed on the interval one to five days. The cost of a board failure and interruption C includes a fixed cost and increases proportionally to the cube of the delivery time . This cost is modeled by . Find
4. The probability that the delivery time does not exceed 4 days but must take at least one day.
5. In terms of and, the expected cost associated with a single failed circuit board. (7marks)
6. Suppose X is a continuous random variable with pdf

Determine

1. The pdf of the continuous random variable Y where
2. (7marks)

**QUESTION TWO (20 MARKS)**

1. Given .

Determine

1. (9marks)
2. A random variable X has the Beta distribution with parameters and as shown below.

Determine by derivation for this distribution, the standard deviation when . (11marks)

**QUESTION THREE (20 MARKS)**

1. The joint probability function of two discrete random variables X and Y is given by

1. Obtain the value of .
2. Obtain
3. Deduce whether or not X and Y independent? (10marks)
4. Consider the Weibull distribution with parameters a and b

Obtain a general expression for the mean and the third raw moment for the distribution. (10marks)

**QUESTION FOUR (20 MARKS)**

1. The joint p.d.f of three continuous random variables X , Y and Z is defined as follows

Calculate:

1. the value of k ,
2. the marginal distribution of X
3. (14marks)
4. Determine the value of c for which the function below is a joint probability density function.

(6marks)

**QUESTION FIVE (20 MARKS)**

1. A random variable Y has a probability density function given by .

Find C hence show that Y has a chi-square distribution. State the degrees of freedom. (10 marks)

1. Let X and Y be two independent standard normal random variables. Suppose and are two new random variables in terms of X and Y. Determine the joint pdf of U and V. (10 marks)