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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 2ndSEMESTER 2015/2016 ACADEMIC YEAR**

**MAIN REGULAR**

**COURSE CODE: SAS 408**

**COURSE TITLE: MULTIVARIATE METHODS**

**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) Let be a random vector with mean vector

And variance-covariance matrix

Find the means and covariance matrix for the linear combination

1. (3 marks)
2. (3 marks)

(b) Let be ∑ with

∑

Prove whether or not the following are independent

1. (3 marks)
2. and (3 marks)

(c) For the matrix

A =

1. Could A be a covariance matrix? Explain (2 marks)
2. Obtain determinant of A and (4 marks)
3. Compute the spectral decomposition of A (4 marks)

(d) Let random variables be distributed as ∑

and

Find the following

1. Correlation matrix of (2 marks)
2. The distribution of (3 marks)
3. The distribution of (3 marks)

**QUESTION TWO (20 Marks)**

1. Show that for
2. Determine the degeneracy for (i) above.

**QUESTION THREE (20 Marks)**

Consider data matrix for n=3 for a bivariate distribution

Evaluate the observed for = . What is the sampling distribution of in this case?

**QUESTION FOUR (20 Marks)**

Consider the covariance matrix

And the derived correlation matrix

Determine the principal components for providing percentage of explained variability for each variate.

**QUESTION FIVE (20 Marks)**

1. Suppose

∑ (covariance matrix) =

Obtain standard deviation and population correlation matrix in the form of and ρ respectively. (10 marks)

1. Given the deviation vectors

and

Compute the sample variance-covariance matrix and the sample correlation matrix using geometric concept. (10 marks)