**THE UNITED REPUBLIC OF TANZANIA**

**PRESIDENT’S OFFICE**

**REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT**

**FORM SIX ZONAL MOCK EXAMINATION – RUVUMA**

**142/2 ADVANCED MATHEMATICS 2**

**Time: 3 Hours Thursday, 27th January 2022 p.m.**

**Instructions**

1. This paper consists of **eight (8)** questions in sections A and B.
2. Answer **all** questions in section A and only **two (2)** questions from section B.
3. Section A carries sixty (60) marks and section B carries forty (40) marks.
4. All work done in answering each question must be shown clearly.
5. NECTA Mathematical tables and non – programmable calculators may be used.
6. Cellular phones and any unauthorized materials are not allowed in the examination room.
7. Write your **examination number** on every page of your answer booklet(s).

**SECTION A (60 Marks)**

**Answer all questions from this section**

1. (a) The random variable X has the probability distribution P() , where = 1, 2, 3, 4 …n

|  |  |  |  |
| --- | --- | --- | --- |
|  | 1 | 2 | 3 |
| P() | 0.1 |  | 0.3 |

Find (i) The value of.

(ii) The mean

(iii) 

(b) The events A and B are independent are such that P(A) = 0.2, P(B) = 0.4 and  
 . Find

1. 
2. 

(c) (i) A continuous random variable X has a probability density function given by

Observation on indicates that the expected value of is 1. Find the values of .

(ii) A problem of probability is given to students A, B and C whose chances of solving it are  
 ½, ¾ and ¼ respectively. What is the probability that the problem will be solved?

1. (a) Use the truth table to show which is valid by saying “ If an egg then a hen or if a hen then an  
    egg” or by saying “ If an egg then a hen and if a hen then an egg”

(b) Let represent the clouds and q represents it rains. Write a word sentence that can be  
 represented by

(i)

(ii)

(c) Write the following arguments in symbolic form and test its validity.

“For candidates win, it is sufficient that he carries Dar es Salaam. He will carry Dar es  
 Salaam only if he takes strong stand on civil rights. He will not take strong stand on civil  
 rights. Therefore he will not win”

1. (a) Find a unit vector perpendicular to both vectors  and  where  and   
    

(b) If a vector makes angles , and with OX, OY and OZ respectively, prove that  
 .

(c) (i) Forces of magnitudes 10, 12 and 14 Newton act in directions of ,    
 and  respectively. What is the work done by their resultant if the particle they

move undergo a distance of 

(ii) The position vector of a particle moving in the plane is given by . Find   
 the velocity and acceleration of this particle at 2.

1. (a) (i) Given that one of the roots of the equation  is . Find the   
    product of the other roots.

(ii) Solve the equation  (express your answers in exponential form).

(b) Point P represents a complex number on the Argand diagram. Describe the locus  
 of P if 

(c) If is an integer and , show that  and that   
 . Use the results to establish the formula  
 

**SECTION B (40 Marks)**

**Answer any two (2) questions from this section**

1. (a) Solve for in the range and if 

(b) Prove that 

(c) Find the maximum and minimum value of  and the corresponding values   
 of  between and 

(d) Solve the equation 

(e) If A, B and C are angles of a triangle, prove that 

1. (a) Find the term independent of in the expansion of 

(b) Solve the equations below:



(c) Prove by Mathematical Induction that is a multiple of 2.

(d) Find the values of if  .

(e) If and are the roots of the equation . Find the equation with the roots  
 and .

(f) Use synthetic division to find the value of given that the polynomial  
  is divisible by

1. (a) Form a differential equation of the family of circles in the first quadrant which touches the  
    coordinate axes.

(b) (i) Find the particular solution of  given that when

(ii) Solve the differential equation .

(c) Solve the differential equation 

(d) It is known that radioactive substances decay at a rate which is proportional to the amount of   
 the radioactive substance present. Write the differential equation, hence for radium the   
 half – life is about 1600 years.

1. Solve the differential equation.
2. Find the decay constant.
3. Find the percentage of a given sample of radium which would still exist after a lapse of 200 years in storage.
4. (a) (i) Show that the equation represent a parabola. Find its focus, vertex,   
    equation for its directrix of the parabola and symmetrical axis

(ii) Find the eccentricity, foci and equations of directrices of the ellipse 

(b) (i) Change the equation  into polar form.

(ii) Express  in Cartesian form.

(c) (i) Show that the line  is a tangent to the hyperbola and find the  
 points of contact.

(ii) Write down the equation of asymptotes graphically to hyperbola and  
 sketch the asymptotes in the Cartesian plane.