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**GARISSA UNIVERSITY**

**UNIVERSITY EXAMINATION 2018/2019 ACADEMIC YEAR FOUR**

**SECOND SEMESTER EXAMINATION**

**SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES**

**FOR THE DEGREE OF BACHELOR OF EDUCATION**

**COURSE CODE: MAT 404**

**COURSE TITLE: NUMERICAL METHODS**

**EXAMINATION DURATION: 2 HOURS**

**DATE: 05/02/2020 TIME: 09.00-11.00 AM**

**INSTRUCTION TO CANDIDATES**

* **The examination has FIVE (5) questions**
* **Question ONE (1) is COMPULSORY**
* **Choose any other TWO (2) questions from the remaining FOUR (4) questions**
* **Use sketch diagrams to illustrate your answer whenever necessary**
* **Do not carry mobile phones or any other written materials in examination room**
* **Do not write on this paper**

**This paper consists of FOUR (4) printed pages *please turn over***

**QUESTION ONE (COMPULSORY)**

 **(a)** Define Beta function  and hence show that it is symmetrical with respect to the

 quantities . **(4 marks)**

 **(b)** Evaluate  **(4 marks)**

**(c)** Evaluate  **(5 marks)**

 **(d)** Determine the inverse Laplace transform of

 **(4 marks)**

 **(e)** Locate and identify the singular points of the differential equation

  **(6 marks)**

 **(f)** Use an appropriate power series method to solve the differential equation 

 about .  **(7 marks)**

**QUESTION TWO (20 MARKS)**

 **(a)** Define a periodic function. **(2 marks)**

 **(b)** Define analytically the periodic function below.

 **f(x)**

 **4**

 **0 2 6 8 12 x (6 marks)**

 **(c)** Determine the Fourier series to represent the periodic functions defined by

 ** (12 marks)**

**QUESTION THREE (20 MARKS)**

 **(a)**  Determine the Laplace transform of  **(5 marks)**

**(b)** Determine the inverse Laplace transformof  **(5 marks)**

**(c)** Use Laplace transform to solve the differential equation: given that

 at ,  and  **(10 marks)**

**QUESTION FOUR (20 MARKS)**

 **(a)** Prove that (a)  **(5 marks)**

 (b)  **(4 marks)**

 **(b)** Prove that following recurrence relations for 

 (a)  **(5 marks)**

 (b)  **(6 marks)**

**QUESTION FIVE (20 MARKS)**

1. Using Rodrigues formula, find the values of  where 

is a Legendre polynomial of degree , hence Express in a series of Legendre

polynomials. **(9 marks)**

 **(b)** Show that  **(8 marks)**

 **(c)** Prove that  **(3 marks)**