ROBERT MUGABE SCHOOL OF HERITAGE AND EDUCATION

DEPARTMENT OF SCIENCE AND TECHNICAL EDUCATION

BACHELOR OF EDUCATION SECONDARY IN-SERVICE HONOURS DEGREE

BACHELOR OF EDUCATION PRIMARY IN-SERVICE HONOURS DEGREE

LEVEL 2 SEMESTER 1

EXAMINATION QUESTION PAPER

MODULE CODE CMTS 212/CMTP212

MODULE NARRATION ANALYSIS

DATE : 2024

DURATION : 3 HOURS

INSTRUCTIONS TO CANDIDATES:

Candidates may answer **ALL** questions in **Section A** and any **THREE** questions from **Section B**

SECTION A (40 marks)

Answer all questions

1. Define and give an example of:
(i) Open set [2]
(ii) Closed set [2]
(iii) Limit point [2]
(iv) Isolated point. [2]

2. State the following results :
(i) The Archimedean principle. [2]
(ii) The law of Trichotomy . [2]

3. (a) Define the following:
(I) Bounded set. [2]
(II) Supremum of a set. [2]
(b) If A = [0,1] find the supremum of A [1]

4. (a) Sketch the graph f(x) = |x+2| + |x-1|. [2]
(b)Explain why f(x) is continuous. [1]

5. (a) Define the interior of a set. [2]
(b) Prove Int(AnB) = Int A)n Int B. [4]

6.(a) (i) Define the limit of a function f(x) [2]
(ii) Prove that lim(f(x) + g(x) = lim f(x) + limg(x). [3]
(b)(i) Let f(x) = |x| show that f(x) is continuous function. [3]
(ii) Give a reason why f(x) is not differentiable at (0,0) . [2]

7. (i) Define a compact set. [1]
(ii)Prove that the set with a fine number of elements is compact. [3]

SECTION B [40 mark]
Answer any 3 questions

8. (a)State Rolles' theorem. [2]
(b)Using Rolles' theorem prove the Mean Value Theorem . [10]
(c) (i) State the Generalised Mean Value Theorem for 2 functions f(x) and h(x) on [a,b] [2]
(ii) Verify the generalized mean value theorem for functions $f(x) = x^3 + 4x + 1$ and $h(x) = x^2 - 3x + 4$ on the interval [0,2] [6]

9. (a) let f(x) be a continuous function on [a.b]
Define the following :
(i) A Partition of [a ,b] [2]
(ii) Riemann upper sum of f(x) on [a, b] . [4]
(iii)Riemann lower sum of f(x) on [a, b] . [4]
(iv) When is f integrable on |a,b|? [2]
(b) Let f(x) = $x^2 + 3x$ on |0, 1|.
Show that f(x) is Rieman integrable on |0,1| . [8]

10. (a) State and prove the Fundamental Theorem of Integral Calculus. [2,4]
(b) Prove that $\int_a^b f(x) + g(x)dx = \int_a^b f(x)dx + \int_a^b g(x)dx$ [6]
(c) State and prove the Mean Value Theorem for integrals for an integrable function f(x) on the interval [a,b]. [2.6]

11. (a) (i) Define a Metric space (X,d). |4|
(ii) Prove that the set of complex numbers is a metric space with respect to the distance function d(x,y) = |x-y| . [6]
(b) State and prove the Cauchy Schwarz inequality in the space R^n . [2,8]

END OF PAPER