Foundation Certificate
in
Information Technology

Final Examination
Term 2 (2023)
February Intake

Mathematics II (FCIT203)

Duration: 3 Hours

Instructions to Candidates:

- This is a closed book examination.
- This paper contains 3 questions on 2 pages without the cover page.
- Answer all questions on the WORKBOOK provided.
- Read all questions before answering.
- The total marks obtainable for this examination is 100.

Question One (30 marks)

1. Factorize the following. (5 x 3 marks)

   i. $9x^2 + 6x + 1 = 0$

   ii. $2x^2 - 7x + 6 = 3$

   iii. $x^2 - 2x - 15 = 0$

   iv. $2x^2 - 4 = 0$

   v. $32 - 4x - x^2 = 0$

2. Simplify the following. (5 x 3 marks)

   i. $\frac{2-x}{x^2+4x-12}$

   ii. $\frac{v^2+7v-30}{-9v-90}$

   iii. $\frac{x^2-9}{2x+6} \div \frac{x-3}{2x}$

   iv. $\frac{x-1}{x^2-4} + \frac{x+2}{x^2-5x+6}$

   v. $\frac{x^2+7x+12}{x-5} \div \frac{x^2+9x+18}{x^2-7x+10}$

Question Two (30 marks)

1. Define the intersection operator for given set A and B? (2 marks)

2. Let the universal set be the set R and let $A = \{x \in R \mid -5 \leq x < 4\}$ and $B = \{x \in R \mid -1 < x \leq 8\}$. Find each of the following. (10 x 1.5 marks)

   i. $A \cup B$

   ii. $A \cap B$

   iii. $A - B$

   iv. $B - A$

   v. A^c

   vi. B^c

   vii. $A^c \cup B^c$

   viii. $A^c \cap B^c$

   ix. $A \cup \phi$

   x. $A \cap \phi$

3. Suppose $A = \{x, y\}$ and $B = \{p, q, r\}$. Find each of the following. (4 x 1 marks)

   i. $A \text{ X } B$

   ii. $B \text{ X } A$

   iii. $P(A)$

   iv. $n(A \cup B)$

4. A survey of 85 students asked them about the subjects they liked to study. 35 students liked math, 37 liked history, and 26 liked physics. 20 liked math and history, 14 liked math and physics, and 3 liked history and physics. 2 students liked all three subjects. (9 marks)

   i. Use a venn diagram to illustrate above scenario.

   ii. How many students want math only?

   iii. How many of these students like math or physics?

   iv. How many of these students didn't like any of the three subjects?

   v. How many of these students liked math and history but not physics?

Question Three (40 marks)

1. Differentiate the following function with respect to x (find $\frac{dy}{dx}$). (4 x 2.5 marks)

   i. $y = x^2 + 2x + 1$

   ii. $y = 4x^5 - 5x^4$

   iii. $y = 4x + \frac{5}{\sqrt{x}}$

   iv. $y = 2x - \frac{1}{x^2} + \frac{3}{\sqrt[3]{x}}$

2. Differentiate the following function with respect to x (find $\frac{dy}{dx}$). (6 x 5 marks)

   i. $y = (3x - 1)^2$

   ii. $y = \sqrt{2x^2 + \frac{4}{x} + 1}$

   iii. $y = (x^2 - 1)\sqrt{4x^2 + 5x - 2}$

   iv. $y = (4x - 2)(x^2 - 1)^3$

   v. $y = \dfrac{3x^2 - 4x + 1}{x + 1}$

   vi. $y = \dfrac{(4x - 1)^2 (x^2 + 1)}{\sqrt{-5x + 1}}$

~~~End of paper~~~