Foundation Certificate
in
Information Technology

Final Examination
Term 2 (2020)
June 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. $x^2 + 5x + 4 = 0$
   ii. $4x^2 + 2x = 12$
   iii. $4x^2 + 17x - 15 = 0$
   iv. $x^4 - 16 = 0$
   v. $(x-4)^2 - 9 = 0$

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

   i. $\dfrac{\frac{4}{3x}+\frac{2}{x^2}}{\frac{x}{x+1}-\frac{4}{x+1}}$

   ii. $\dfrac{\frac{6}{x-4}+2}{2-\frac{4}{x-4}}$

   iii. $\dfrac{m^{-2}+2m^{-1}}{m+4m^{-2}}$

   iv. $\dfrac{5}{(3x-2y)(6x+7y)} - \dfrac{2}{(5x+3y)(2y-3x)}$

   v. $\left(\sqrt{x^3+1} - \dfrac{3x^3}{2\sqrt{x^3+1}}\right) \div \sqrt{x^3+1}$

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 $A = \{x \in R | -5 < x < 4\}$ and $B = \{x \in R | 1 < x \leq 4\}$. 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 $B = \{1,2,3\}$. Find each of the following. (4 x 1.5 marks)

   i. $A \text{ X } B$

   ii. $B \text{ X } A$

   iii. $P(A)$

   iv. $n(P(A \cup B))$

4. In a class 40% of the students enrolled for Math and 70% enrolled for Economics. If 15% of the students enrolled for both Math and Economics. (7 marks)

   i. Use a venn diagram to illustrate above scenario.

   ii. What % of the students of the class did not enroll for either of the two subjects?

Question Three (40 marks)

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

   i. $y = x^5 + 6x + 10$

   ii. $y = -8x^{-1/4} - x^{2/3}$

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

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

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

   i. $y = (x^2 - 16x + 8)(x^2 - 2)$

   ii. $y = \sqrt{x^2 + 5x + 5}$

   iii. $y = \frac{(4x+3)}{(2x+1)}(2x^2 + 5x - 2)$

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

   v. $y = \dfrac{x^2 - 4x + 4}{5x + 1}$

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

~~~*End of paper*~~
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