Sri Lanka Institute of Information Technology

B.Sc. Degree
in
Information Technology

Final Examination
Year 1, Semester 1 (2016)
June Intake

Mathematics for Information Technology (N109)

Duration: 3 Hours

SLIIT COMPUTING LIBRARY

Instructions to Candidates:

- This is a closed book examination.
- This paper contains 5 questions on 2 pages without the cover page.
- Answer all questions in the WORKBOOK provided.
- Read all questions before answering.
- The total marks obtainable for this examination is 100.

Question 1 (15 marks)

(a) Consider the function: $f(x) = (x+6)(x-3)^2$

(i) Find the critical numbers of the above function. (4 marks)

(ii) Find the intervals where $f(x)$ is increasing or decreasing. (2 marks)

(iii) Find the values of $f(x)$ at the relative extrema and inflection points of $f(x)$, if any. (4 marks)

(iv) Sketch the graph of $f(x)$. (1 mark)

(v) Find the absolute extrema of the above $f(x)$ on $[0,5]$. (4 marks)

Question 2 (15 marks)

(a) Solve the following equations for x. (4 x 1.5 marks)

(i) $\log_4 x + \log_4(x-12) = 3$

(ii) $\log_e(-x^2+2x) = \log_e(x) + 4$

(iii) $e^{3x-7} = 5e^{x-1}$

(iv) $e^{2x} = \frac{e^{x^2}}{e^2}$

(b) Differentiate the following functions. (3 x 3 marks)

(i) $f(x) = 3x^2(x^3+1)^7$

(ii) $f(x) = \frac{x^3+6x}{x^2+2}$

(iii) $f(x) = \frac{5e^x}{3e^x+1}$

SAMPLE COPY

Question 3 (20 marks)

(a) Find the following integrals. (4 x 2.5 marks)

(i) $\int (x^{\frac{1}{2}} - 3x^{\frac{2}{3}} + 6)dx$

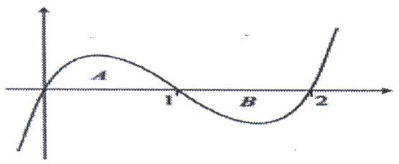
(ii) $\int (\frac{e^x}{2} + x\sqrt{x})dx$

(iii) $\int x^3(2x + \frac{1}{x})dx$

(iv) $\int xe^{2x}\,dx$

(b) It is estimated that t months from now the population of a certain town will be changing at the rate of $4 + 5t^{\frac{2}{3}}$ people per month. If the current population is **10000**, what will the population be in **8** months from now on? (5 marks)

(c) What is the area under the curve $f(x) = x^3 - 3x^2 + 2x$, the x $axis$, $x = 0$ and $x = 2$. (5 marks)



Question 4 (20 marks)

(a) Assume $C = \begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix}$, Find $C^2 - 3I$. (4 marks)

(b) (i) Find the inverse of the following matrix A, using the formula, (10 marks)

$$A^{-1} = \frac{1}{\det(A)} adj(A)$$

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 1 \\ 3 & 0 & -1 \end{bmatrix}$$

(ii) Solve the following system of linear equations with the use of inverse matrix method. Hint: $x = A^{-1}b$ (6 marks)

$$x + 2y + 3z = 9$$
$$2x - y + z = 8$$
$$3x - z = 3$$

Question 5 (30 marks)

(a) Solve the following system of linear equations using the Cramer's rule. (10 marks)

$$x + 2y + 3z = 9$$
$$2x - y + z = 8$$
$$3x - z = 3$$

(b) Solve the following system of linear equations using the Gaussian elimination method. (10 marks)

$$x + 2y + 3z = 9$$
$$2x - y + z = 8$$
$$3x - z = 3$$

(c) Find the inverse of matrix D, using the Gaussian elimination method. (10 marks)

$$D = \begin{bmatrix} 3 & 0 & 2 \\ 2 & 0 & -2 \\ 0 & 1 & 1 \end{bmatrix}$$

End of the Question Paper