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Sri Lanka Institute of Information Technology

B. Sc. Special Honours Degree/Diploma

in

Information Technology

Repeat Examination

Year 1, Semester I (2016)

MA140 – Mathematics for Information Technology

Duration: 3 Hours

May, 2016

Instructions to Candidates:

- Answer **all** the questions in the paper itself.
- Total marks 100.
- This paper contains 9 pages without the cover page.
- Calculators are not allowed.
- Electronic devices retrieving text including electronic dictionaries and mobile phones are not allowed.

18/05/2016

Question 01   20 marks

a) Find the slope of the function $f(x) = \frac{x^2-5}{x}$ at (1, -4).   (4 marks)

b) Find the following indefinite integral $\int (7x^6 + 10x^4 - 3x^2 + 5)dx$.   (4 marks)

c) Find the area of the subtending arc if $\theta = \frac{2\pi}{5}$ and $r = 10$.   (4 marks)

18/05/2016

d) Assume that $A = \begin{bmatrix} 1 & -1 & 2 \\ 2 & -1 & 3 \\ 0 & 1 & -1 \end{bmatrix}$. Find the determinant of A using the properties of determinants.

(4 marks)

e) Assume that $A = \begin{bmatrix} 4 & 3 \\ 3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 3 \\ 3 & -4 \end{bmatrix}$. Show that B is the inverse matrix of A.

(4 marks)

Question 02   20 marks

a) Assume that $A = \begin{bmatrix} 1 & 0 & 3 \\ 1 & 5 & 2 \\ 4 & -1 & 0 \end{bmatrix}$. Find $A^2 + 3A - I$.

(4 marks)

b) Rainbow Harbor Cruises charges $16/adult and $8/child for a round-trip ticket. The records show that, on a certain weekend, 1000 people took the cruise. Total receipts for weekend were $12,800. Write 2 equations to determine how many adults and children took the cruise on weekend.

(2 marks)

c) Write the above 2 equations in matrix form $Ax = b$.

(2 marks)

d) Find the inverse of the above coefficient matrix (A).

(3 marks)

e) Using the solution in (d), determine how many adults and children took the cruise on weekend.

(3 marks)

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f) Find the Eigen values and Eigen vectors of $A = \begin{bmatrix} 6 & 4 \\ 3 & 5 \end{bmatrix}$. (6 marks)

Question 03 20 marks

a) Consider the following function $f(x)$;
$$f(x) = (x - 1)^2 + x^2 - 4$$
   i) Find the critical values of the above function. (4 marks)

   ii) Find the intervals in which $f(x)$ is increasing or decreasing. (4 marks)

iii) Draw the graph of $f(x)$ on the interval [-1, 1]. (6 marks)

iv) Find all relative extrema of the function $f(x)$. (3 marks)

v) Find the absolute extrema on the interval [-1, 1]. (3 marks)

Question 04   20 marks

a) Evaluate the following definite integral $\int_{-3}^{2} y^2 + |2y + 4|\, dy$. (6 marks)

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b) Assume that $f'(x) = (x - 1)^2 + x^2$. Find the function $f(x)$ given that $f(-1) = 1/3$.

(6 marks)

c) Use Trapezoidal rule to approximate the value of $\int_0^2 (\frac{x+5}{3})dx$ when $n = 4$.

(8 marks)

Question 05   20 marks

a) Using Cramer's rule find the solution of the following system of linear equations.

$$2x - 4y + 5z = -33$$
$$4x - y = -5$$
$$-2x + 2y - 3z = 19$$

(6 marks)

b) Find the inverse of the following matrix using the equation $A^{-1} = \frac{adj\ A}{|A|}$.

$$A = \begin{bmatrix} 7 & 5 & 2 \\ 2 & 0 & -2 \\ 0 & 1 & 1 \end{bmatrix}$$

(10 marks)

c) Using the solution in (b) solve the following system of linear equations.

$$7x + 5y + 2z = 80$$
$$2x - 2z = 40$$
$$y + z = 20$$

(4 marks)

End of the Paper