NATIONAL SCHOOL OF BUSINESS MANAGEMENT

BSc in Software Engineering/BSc in Computer Science/Computer Networks (NSBM)

BSc in Management Information Systems (UCD & NSBM)

BSc in Software Engineering / Computer Networks/Computer Security (PLY)

Bachelor of Information Technology (VU) Degrees

Special Repeat Examination

1st Year: MA101.3 Mathematics for Computing
Date: 25 November 2020

Instructions to Candidates

1) **Answer any five questions**

2) Time allocated for the examination is three (03) hours.

3) Calculators are allowed.

4) Total number of pages - Five (05)

5) If a page or a part of this question paper is not printed, please inform the Supervisor immediately.

6) Write your index number in all pages of answer script.

7) Stapler all answer sheets at the end of the examination.

Question 1 (Set Theory) [20 marks]

1. Fill in the blanks with $\in$, $\notin$, $\subseteq$, = or $\neq$. Recall that $\mathbb{Z}$ is the set of all integers and ϕ is the empty set. (10 marks)

   i.   2   ----------   {2, 4, 7}

   ii.   7   ---------- $\mathbb{Z}^+$

   iii.   {1, -2, 8}   ---------- $\mathbb{Z}$

   iv.   21   ----------   {168, 147, 126, …}

   v.   {16}   ----------   {4, 8, 12}

2. Given the universal set U= {1, 2, 3, 4, 5, 7, 9, 11, 13, 15} , A= {1, 3, 9, 15}, B= {3, 9, 11}, D={2, 4} find the following.

   i.   A ∩ B (2 marks)

   ii.   (A ∪ D)' (2 marks)

   iii.   D x B (2 marks)

   iv.   Find all subsets of A. (2 marks)

3. In a class of 30 students, 16 like English, 13 students like Science and English, 6 students do not like Science or English. How many Students like only Science? (2 marks)

Question 2 (Propositional Logic) [20 marks]

1. Given that p, q and r are propositions, construct truth tables and verify the following:

   i. $\sim (p \lor q) = \sim p \land \sim q$ (4 marks)

   ii. $p \land (q \land r) = (p \land q) \land r$ (4 marks)

   iii. $\sim ((p \lor q) \land r) = (\sim p \land \sim q) \lor \sim r$ (4 marks)

2. Determine whether the following compound propositions are tautologies, contradictions or contingent propositions?

   i. $p \land (q \land \sim q)$ (4 marks)

   ii. $p <=> (\sim p \land q)$ (4 marks)

Question 3 (Coordinate Geometry) [20 marks]

1. The general form of the equation of a straight line(L_1) is 8x-2y-6=0.

   i.   Write L_1 in y=mx+c format. (2 marks)

   ii.   What is the slope? (2 marks)

   iii.   What is the intercept? (2 marks)

iv.   Find the line equation parallel to L_1 going through the point (3, 2)   (2 marks)

2. **L$_{XY}$**: $x - y + 1 = 0$ **L$_{XZ}$**: $3x + y - 13 = 0$ **L$_{YZ}$**: $x + 3y - 7 = 0$ are line equations of the sides of the triangle XYZ.
    i.   Find the vertices (X, Y and Z) of the triangle.   (6 marks)
    ii.   Determine equation of the circle through X, Y and Z points.   (6 marks)

Question 4 (Matrix Algebra)   [20 marks]

If $A = \begin{bmatrix} 1 & 5 \\ 3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 2 \\ -1 & 4 \end{bmatrix}$

  1. Find the following:
     i.   A + B   (2 marks)
     ii.   Determinant of A − B   (3 marks)
     iii.   AB   (3 marks)

  2. Solve the following system of linear equations using matrix inversion.   (12 marks)

$$x - 2y + z = 7$$
$$2x + y - 2z = -3$$
$$x + 2y - 3z = -9$$

Question 5 (Logarithms)   [20 marks]

  1. Use the Laws of Logarithms to expand each expression.
     i. $\log_2 2x^2$ (3 marks)
     ii. $\log_3(x^2 y^{-3})$ (3 marks)
     iii. $\ln\left(\frac{a^2\sqrt{b^3}}{\sqrt[5]{c^2}}\right)$ (3 marks)

  2. Evaluate the following:
     i. $\log_7 5$ (2 marks)
     ii. $\log_3 81 \; \log_5 0.008 \; \log_8 0.125$ (4 marks)

  3. Solve the equation $5^{2x} - 12(5^x) + 35 = 0$. Find the value of x for three decimal places.
          (5 marks)

Question 6 (Statistics)   **[20 marks]**

1. Briefly describe the terms 'Median', and ''Mode''?   (4 marks)

2. The Bookstall Inc. is a special bookstore selling used books. Paperbacks are $ 1.00 each and hardcover books are $ 3.50 each. Last Tuesday morning 50 books were sold. Out of that 40 were paperbacks and the rest were hardcover. What was the weighted mean price of a book sold?   (3 marks)

3. The following data selected randomly, represent the daily temperature measurements (in Celsius degrees) of eleven days of a town.

    27, 23, 28, 19, 34, 28, 32, 20, 28, 25 and 18

    Find the following:

    a. Mean   (2 marks)
    b. Median   (2 marks)
    c. Mode   (2 marks)
    d. Interquartile range   (3 marks)
    e. Standard Deviation   (4 marks)

Question 7 (Statistics)   **[20 marks]**

1. Explain the following terms briefly
        a. Population   (2 marks)
        b. Census   (2 marks)

2. The table given below is a frequency distribution that shows the profit made by 100 businesses.

Profit (Rs. in 000s)	Number of companies
20 – 25	02
25 – 30	05
30 – 35	14
35 – 40	20
40 – 45	25
45 – 50	17
50 – 55	10
55 – 60	07

Calculate the following statistical parameters:

    a. Mean   (3 marks)

    b. Median   (4 marks)

    c. Mode   (4 marks)

    d. Standard Deviation.   (5 marks)

Note: Median, Mode and Standard Deviation for grouped data are calculated as follows:

$$Median = L + \frac{\left(\frac{n}{2}\right) - m}{f} \times c \qquad Mode = L + \frac{(f_1 - f_0)}{(f_1 - f_0) + (f_1 - f_2)} \times c \qquad Std = \sqrt{\frac{\sum f_i (x_i - \bar{x})^2}{n - 1}}$$

End of Paper