



NATIONAL SCHOOL OF BUSINESS MANAGEMENT

BSc in Management Information Systems (Special) (NSBM)– 20.3

BSc (Hons) in Software Engineering (NSBM)– 20.3

BSc (Hons) in Computer Science (NSBM)– 20.3

BSc (Hons) Software Engineering (PU) – 20.3

BSc (Hons) Computer Networks (PU) – 20.3

BSc (Hons) Computer Security (PU) – 20.3

Bachelor of Information Technology (VU)- 20.3

Year 01 Semester 01 Examination

24 May 2021

MA101.3 – Mathematics for Computing

Instructions to Candidates

- 1) Answer ALL questions
- 2) Time allocated for the examination is three (03) hours and 30 minutes
(Including downloading and uploading time)
- 3) Weightage of Examination: 60% out of final grade
- 4) Download the paper, provide answers to the selected questions in a word document.
- 5) Please upload the document with answers (Answer Script) to the submission link before the submission link expires
- 6) Answer script should be uploaded in PDF Format
- 7) Under any circumstances E-mail submissions would not be taken into consideration for marking. Incomplete attempt would be counted as a MISSED ATTEMPT.
- 8) The Naming convention of the answer script – Module Code_Subject name_Index No
- 9) You must adhere to the online examination guidelines when submitting the answer script to N-Learn.
- 10) Your answers will be subjected to Turnitin similarity check, hence, direct copying and pasting from internet sources, friend's answers etc. will be penalized.

Question 01 [20 Marks]

1. Simplify the following by using the laws of indices. Express each expression in positive exponents.

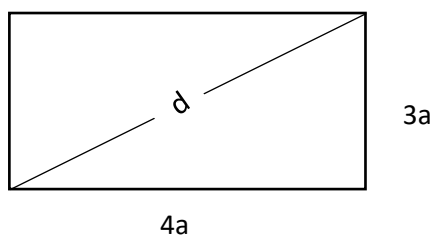
I. $\frac{x^5 y^{-8} z^3}{x^1 y^{-4} z^{-3}}$

II. $4p^{-3} + 4p^{-3} + 4p^{-3} + 4p^{-3}$

III. $2^{10} \times 16^2$

(3 Marks)

2. A rectangle has a length of $4a$ cm and a width of $3a$ cm as follows.



- I. Find the area of above rectangle.

(1 Mark)

- II. Find the length of the diagonal (shown in “d”) using Pythagorean theorem.

(1 Mark)

3.

- I. Fill in the blanks with \in , \notin , \subseteq , $=$ or \neq . Note that each symbol can be used more than once.

a) Φ _____ $\{1, 3, 5, 7, \dots\}$

b) -5 _____ \mathbb{Z}^-

c) 2 _____ $\{1, 3, 5, 7, 9\}$

d) $\{2, 4, 6, 8, 10\}$ _____ $\{10, 8, 6, 4, 2\}$

e) -1 _____ A where $A = \{x \mid x \in \mathbb{Z}^+, x < 7\}$

(5 Marks)

II. Given the Universal Set $U = \{a, b, c, d, e, f, g, h, i, j, k, l, m, n\}$

$$A = \{a, e, i\} \quad B = \{b, c, d, f, g\} \quad C = \{a, b, d, i, j, k, l\}$$

Find the following.

a) $A \cap C$

b) $B \cap (A \cup C')$

c) $A' - C'$

d) $|P(A)|$

e) All subsets of set A (5 Marks)

III. In a class there are 100 students. Among them 28 students like Mathematics, 31 students like Physics, 42 students like Chemistry, 9 students like both Mathematics and Physics, 10 students like both Mathematics and Chemistry, 6 students like Physics and Chemistry and 4 students like all 3 subjects

a) Draw a Venn Diagram and show the values accordingly. (2 Marks)

b) How many students like none of the 3 subjects? (1 Mark)

c) How many students like only for Mathematics? (1 Mark)

d) How many students like both Physics and Chemistry, but not Mathematics? (1 Mark)

Question 02 [20 Marks]

1. Construct the truth table of

i. $\sim p \vee q$ (2 Marks)

ii. $p \wedge \sim q$ (2 Marks)

2. Show that $(p \Rightarrow q) \Rightarrow (\sim p \Rightarrow \sim q)$ is logically equivalent to $p \vee \sim q$ (5 Marks)

3. Given that p, q, and r are propositions, construct a truth table to verify following.

$$\sim ((p \vee q) \wedge r) = (\sim p \wedge \sim q) \vee \sim r \quad (5 \text{ Marks})$$

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

I. $p \wedge \sim q \Rightarrow q \vee p$ (2 Marks)

II. $\sim (p \wedge r) \Leftrightarrow \sim (r \wedge p)$ (2 Marks)

III. $p \Leftrightarrow (\sim p \wedge q)$ (2 Marks)

Question 03 [20 Marks]

1. If $A = \begin{bmatrix} 3 & 2 \\ -1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -4 \\ 3 & 1 \end{bmatrix}$
- a) Find $A + B$ (2 Marks)
 - b) Determinant of $A - B$ (2 Marks)
 - c) AB (2 Marks)
 - d) B^{-1} (2 Marks)

2. Show that following relationship holds. (4 Marks)

$$\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix} = 0$$

3. Solve the following system of linear equation using matrix inversion. (Write down the steps) (8 Marks)

$$x - y + z = 8$$

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

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

Question 04 [20 Marks]

1. The general form of an equation of a straight line L_1 is $6y - 8x - 10 = 0$
- I. What is the slope and the intercept of the line? (2 Marks)
 - II. Find the line equation that is perpendicular to L_1 going through the point (4,2). (3 Marks)
2. In a triangle OAB, O is at the origin, A is the point (0,6) and B is the point (6,0).
- I. Sketch the triangle. (1 Mark)
 - II. Find the equation of the three medians of the triangle. (3 Marks)
- (Note: A median of a triangle is a line joining one of the vertices to the midpoint of the opposite side.)**
- III. Show that, point (2,2) lies on all 3 medians. (This shows the medians of this triangle are concurrent) (3 Marks)
3. Suppose the lines.

$$L_1 \quad 3x - y = 0$$

$$L_2 \quad x + 3y - 20 = 0$$

$$L_3 \quad x - 2y = 0$$

- I. Find the vertices of the triangle created by these lines. (3 Marks)
- II. Find the circle equation goes through the triangle vertices. (2 Marks)
- III. Find the area of the triangle. (3 Marks)

Question 05 [20 Marks]

1. Consider the sample data values below and find the followings.

50, 52, 54, 61, 70, 47, 40, 30, 70, 61, 70, 82, 51, 70, 54, 50

- I. Mean (1 Mark)
 - II. Median (1 Mark)
 - III. Mode (1 Mark)
 - IV. Q_1 , Q_2 , Q_3 (3 Marks)
 - V. Variance (3 Marks)
 - VI. Standard Deviation (1 Mark)
2. Convert the following expressions to the given form.
 - I. Write each of the following in logarithmic form. (3 Marks)
 - a) $a^{2n} = x$
 - b) $4^3 = 64$
 - c) $a^{\frac{1}{m}} = b$
 - II. Write each of the following in exponential form. (2 Marks)
 - a) $\log_a b = n$
 - b) $\log_3 27 = 3$
 3. Solve followings.
 - I. Given that $a = 2^q$ and $b = 4^p$ show that $\log_2(a^3b) = 3q + 2p$ (1 Mark)
 - II. Show that $\log_b 36 + \frac{1}{2}\log_b 256 - 2\log_b 48 = -\log_b 4$ (2 Marks)
 - III. Given that $2\log_2(x + 13) - \log_2 x = 6$ show that $x^2 - 38x + 169 = 0$ (2 Marks)

--END OF THE PAPER--