NATIONAL SCHOOL OF BUSINESS MANAGEMENT

BSc in Management Information Systems (Special) (NSBM)– 21.1
BSc (Honours) in Software Engineering (NSBM)– 21.1
BSc (Honours) in Computer Networks (NSBM)– 21.1
BSc (Honours) in Computer Science (NSBM)– 21.1
BSc (Honours) Software Engineering (PU)– 21.1
BSc (Honours) Computer Networks (PU)– 21.1
BSc (Honours) Computer Science (PU)– 21.1
BSc (Honours) Computer Security (PU)– 21.1
Bachelor of Information Technology (NBIT): major in Web and Mobile Application Development (VU)– 21.1

Year 01 Semester 01Examination

28th October 2021

MA 101.3 – Mathematics for Computing

Instructions to Candidates

1) **Answer all the questions.**
2) **Time allocated for the examination is five (05) hours (Including downloading and uploading time)** . (Note: **No email submissions are accepted under any condition.**)
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 1 : Numbers, Indices & Surds [20 Marks]

1. Identify which of the following are rational / irrational numbers. (5 Marks)
   a) 1/27
   b) $\sqrt{6}$
   c) $22/7$
   d) 1/3
   e) $2/\sqrt{3}$
2. Find the simplified form of the following. Each expression should have positive exponents. (5 Marks)
   a) $(p^2)^4$
   b) $(p^{-3})^5$
   c) $(p^{-5})^4$
   d) $y^3(y^{-5})^3$
   e) $(4m)^4$
3. Solve each equation. Use the fact that if a^x=a^y then $x = y$. (3 Marks)
   a) $4^x = 2^6$
   b) $3^{2x} = 9^4$
   c) $2^x = \frac{1}{32}$
4. What is the simplified form of each expression? (4 Marks)
   a) $\frac{y^5}{y^4}$
   b) $\frac{d^3}{d^9}$
   c) $\frac{x^4y^{-1}z^8}{zx^4y^5}$
5. Simplify each expression. (3 Marks)
   a) $3^2(3x)^3$
   b) $(4.1)^5(4.1)^{-5}$
   c) $(b^5)^3b^2$

Question 2 : Set Theory [20 Marks]

1. Fill in the blanks with **∈, ∉, ⊆, =** or **≠.** Note that each symbol can be used more than once. (3 Marks)
   a) 0 ---------- {2, 4, 5, 6}
   b) {1, 4} ---------- {2, {1,4}, 7}

c) {2, 3} ---------- {1, 2, 3, 4}

d) 4 ---------- {1, {2, 3}, 4, 5}

e) {0.5, -2} ---------- {x|$2x^2$+3x-2=0 and x is a real number}

2. In a batch of 238 computing students, 103 are members of FOSS community, 82 are members of Robotics community and 95 are members of Innovation Community. 15 of them are having the membership of both FOSS and Robotics, 19 of them are having the membership of both Innovation and Robotics and 22 of them are having the membership of both FOSS and Innovation. 6 students do not have the membership of any of these communities.

(5 Marks)

a) Draw a Venn diagram to show the above information.

b) How many students are only members of Innovation club?

c) How many students are in all three clubs?

3. Find the following Cartesian Products of sets (5 Marks)

If A= {a, b}, B= {3, 5}, C= {2, 3} Find

a) A x (B ∪ C)

b) (A x B) ∪ (A x C)

c) A x (B ∩ C)

d) (A x B) ∩ (A x C)

4. A relation between two non-empty sets A and B is given as follows (4 Marks)

{(1,3), (2,2), (3,4), (4,8), (5,10), (5,12)}

a) Draw the Pictorial Representation of the above relations between Set A (Domain) and Set B (Range).

b) Is the above Relation is a Function Justify your answer?

5. Draw the directed graph of the relation R on the set (3 Marks)

A = {0, 1, 2, 3, 4},

Let R= {(0,0), (0,1), (0,2), (1,4), (2,3), (3,1), (4,2)}

Question 3 : Propositional Logic [20 Marks]

1. Explain the concept of Proposition briefly and contrast the difference between a Proposition and a Composite Proposition. (2 Marks)

2. Construct the truth tables for the following Propositions. (4 Marks)

a) (~p) ∨ (~ q) ∧ r

b) (~p) ∨ (q) ∧ (~ r)

3. Verify the following using truth tables: (4 Marks)

   a) ~ (p ∧ q)= (~p) ∨ (~ q)

   b) ~ (p ∨ q)= (~ p) ∧ (~ q)

   c) ~ ((p ∨ q) ∧ r) = (~ p ∧ ~ q) ∨ ~ r

4. Construct the truth table of (5 Marks)

   a) (p => q) ∧ (q => p)

   b) ~ (p ∧ q) ∨ ~(q <=> p)

5. Find whether following propositions are Tautology, Contradiction or Contingent Proposition. (5 Marks)

   a) (p=>q) ∧ (q=>r)] => (p=>r)

   b) (¬p → ¬r) ∨ q

   c) q → (p → r)

   d) (p →q) ∨(q→p)

Question 4 : Matrices [20 Marks]

1. Consider the following two matrices and find the following. (3 Marks)

$$A=\begin{bmatrix}3 & 2 & 1\\ 8 & 3 & 4\end{bmatrix} \qquad B=\begin{bmatrix}1 & -1\\ -2 & 2\\ 0 & 1\end{bmatrix}$$

   a) A + B

   b) 2A – 3B

   c) A × B

2. Find the inverse of the following two matrices. (4 Marks)

$$A=\begin{bmatrix}-3 & -5\\ 2 & 6\end{bmatrix} \qquad B=\begin{bmatrix}7 & 3\\ -2 & -1\end{bmatrix}$$

3. Simplify the following simultaneous equations using matrices clearly mentioned all the workings. (4 Marks)

$$3x+4y=25$$
$$4x+3y=24$$

4. Find the inverse of the following matrices clearly mentioned all the workings. (4 Marks)

$$A=\begin{bmatrix}1 & 7 & -6\\ 8 & 4 & 3\\ -6 & -2 & 5\end{bmatrix}$$

5. Computer hardware producing company records the following production costs details of the past three days. Company producing RAM cards VGA cards and Solid State Drives. To produce 2 Rams, 3 VGA cards and 4 SSD it costs Rs. 38000. To produce 4 Rams, 2 VGA cards and 3 SSD it costs Rs. 32000. To produce 3 Rams, 4 VGA cards and 2 SSD it costs Rs. 38000. Find the cost of each RAM, VGA card and SSD they produce using matrices clearly mentioned all the workings. (5 Marks)

Question 5 : Coordinate Geometry [20 Marks]

1. Find the gradient and the interception of the following equations. (3 Marks)
   a) $2y = -5x + 7$
   b) $y - 3x = -5$
   c) $y = 4$
2. Plot the graphs of following two lines in the same grid and find and plot the intersection point of them. (3 Marks)

   $4x + 7y = 20$

   $21x - 13y = 21$
3. What is the distance *d* of the point *P*(-6, -7) from the line *L* with equation 3*x* +4*y* = 11. (2 Marks)
4. Find the equations of the following. (3 Marks)
   a) Equation of a line(L_1) through points (3, 4) and (-4, -6).
   b) Equation of a line (L_2) Perpendicular to line $y = 2x + 3$ and that goes through the point (3, 4)
5. Write the equations of the following circles. (4 Marks)
   a) Equation of a circle given the center C(2,3) and radius 5.
   b) Equation of a circle given the center C(2,-3) and the point A(8,5).
   c) Equation of the circle that goes through points (4,2), (2,0) and (0,2).
6. Find the Cartesian points of following polar coordinates with center coordinates (3 Marks)
   a) (6,35) -- center (3,3)
   b) (20,45) -- center (-4,5)
7. Find 3 points on the circle defined by: (2 Marks)

   $x^2 + y^2 - 8x - 6y + 21 = 0$

END OF THE PAPER