B.A/B.Sc. 3rd Semester (Honours) Examination, 2021 (CBCS)

Subject: Mathematics

Course: BMH3SEC11

(Logic and Sets)

Time: 2 Hours Full Marks: 40

The figures in the margin indicate full marks.
Candidates are required to write their answers in their own words as far as practicable.
[Notation and Symbols have their usual meaning]

Answer any eight questions 8×5 = 40

(1) Let S = {2, 3, 4, 5, 6, 7, 8, 9, 10}. Define a relation R on S by: "a R b if and only if a is a divisor of b". Prove that R is a partial order on S. Find the maximal and minimal elements of the poset (S, R). [2+3]

(2) (i) Let A, B, C be subsets of a universal set I and $A\Delta B = C$. Then prove that $A=B\Delta C$.

(ii) Let ρ be an equivalence relation on a set S and a,b belong to S. If a is not related to b then prove that Cl(a) and Cl(b) are disjoint. [3+2]

(3) What is a contradiction statement in logic? Use truth table to determine whether the following statement is a tautology, or a contradiction or a contingent: [1+4]
$((P\rightarrow Q) \rightarrow P)\rightarrow P$.

(4) What are logically equivalent statements? Check whether the following two logical statements are logically equivalent or not: [1+4]

I. $(P\wedge Q)\rightarrow R$

II. $P \rightarrow (Q\rightarrow R)$.

(5) Differentiate, with proper example, between a singular proposition and a general proposition. What are quantifiers? Explain the two different types of quantifiers with examples. [2+3]

(6) (i) Write the contrapositive and converse statements of the following statement: "If n is a multiple of 12 then n is a multiple of 4".

(ii) Rewrite the following logical formula using only NOT and AND logical operators: $(P\vee A)\rightarrow(Q\wedge X)$. [3+2]

(7) Use truth table to determine the validity or non-validity of the following argument: [5]
$P \rightarrow (Q\rightarrow R)$
$P\rightarrow Q$
Hence, $P \rightarrow R$.

(8) (a) Translate the following logical propositions:

(i) The crop will be destroyed if there is a flood.

(ii) A positive integer is prime only if it has no divisors other than 1 and itself.

(b) If p: You have a flu, q: You miss the final examination, r: You pass the course, then express the following statements in plain English: [2+3]

I. $\sim q \leftrightarrow r$ II. $(p \wedge q) \vee (\sim q \wedge r)$.

(9) Translate the following statements using quantifiers: [5]

(i) All fruits and vegetables are wholesome and delicious.

(ii) Some medicines are dangerous only if taken in excessive amounts.

(iii) Snakes are not all poisonous.

(10) (a) Use quantifiers to say that " $\sqrt{3}$ is not a rational number".

(b) If A and B are true statements, X and Y are known to be false statements but the truth values of P and Q are not known, then find the truth values of the following statements: [2+3]

1. $(P \wedge Q) \wedge (\sim A \vee X)$
2. $\big(P \vee (Q \wedge A)\big) \wedge (\sim \big((P \vee Q) \wedge (P \vee A)\big))$
3. $Q \vee (\sim (P \wedge Q))$

B.A/B.Sc. 3rd Semester (Honours) Examination, 2021 (CBCS)

Subject: Mathematics

Course: BMH3SECI2

(Computer Graphics)

Time: 2 Hours Full Marks: 40

The figures in the margin indicate full marks.

Candidates are required to write their answers in their own words as far as practicable.

[Notation and Symbols have their usual meaning]

Answer any eight questions 8×5 = 40

(1) Discuss CMY color model in brief. [5]

(2) Discuss Random Scan in brief. [5]

(3) Briefly describe the working principle of an ink jet printer. [5]

(4) Discuss the mathematical foundation behind Bresenham's line drawing algorithm. [5]

(5) Write a short note on graphics input devices. [5]

(6) Discuss the Bresenham's circle drawing algorithm. [5]

(7) Briefly discuss 4-connected and 8-connected neighbors in the context of filling. [5]

(8) (i) Discuss rotation of a rigid body in brief.

(ii) What do you mean by pivot point? [4+1]

(9) Write a short note on two dimensional viewing. [5]

(10) Discuss Cohen-Sutherland line clipping algorithm in brief. [5]

B.A/B.Sc. 3rd Semester (Honours) Examination, 2021 (CBCS)

Subject: Mathematics

Course: BMH3SEC13

(Object Oriented Programming in C++)

Time: 2 Hours Full Marks: 40

The figures in the margin indicate full marks.
Candidates are required to write their answers in their own words as far as practicable.
[Notation and Symbols have their usual meaning]

Answer any eight questions 8×5 = 40

(1)	(i)	What are the steps involved in executing a C++ program?	[2]
	(ii)	What are linker errors? Explain them with examples.	[3]
(2)	(i)	Explain the use of '*goto'* statement with example.	[3]
	(ii)	What are local variables? Give example.	[2]
(3)		Write the differences between structure and class with examples.	[5]
(4)	(i)	Explain the use of logical "!" operator.	[2]
	(ii)	Write a C++ program to sort the given numbers in ascending order.	[3]
(5)		What do you mean by the conditional execution? Differentiate between sequential execution and conditional execution.	[2+3]
(6)		Explain the use of inline function with an example.	[5]
(7)		Write a program to find the roots of the quadratic equation $a\,x^2 + b\,x + c = 0$ for the given values of a, b and c.	[5]
(8)		What is operator overloading? Write the differences between overloading a unitary operator and a binary operator.	[2+3]
(9)	(i)	What is a class template? Explain its syntax.	[2+1]
	(ii)	What is function template?	[2]
(10)		Explain the exception handling mechanism with example.	[5]