U.G. 3rd Semester Examination - 2020

MATHEMATICS

[HONOURS]

Skill Enhancement Course (SEC)

Course Code : MATH-H-SEC-T-1A&B

Full Marks : 40 Time : 2 Hours

The figures in the right-hand margin indicate marks.

Symbols have their usual meaning.

Answer all the questions from selected Option.

OPTION - A

MATH-H-SEC-T-1A

1. Answer any **five** questions: 3×5=15

   a) Write the following sentence using symbolic logic: "The sum of two numbers is even if and only if either both numbers are even or both numbers are odd".

   b) Write truth table of conditional and bi-conditional statements.

   c) What is tautology? Give an example with justification.

   d) Translate the following sentence into symbols, first using no universal quantifiers, then using no existential quantifiers: "Every number is either negative or has a square root".

[Turn over]

   e) A relation R is defined on the set $\mathbb{Z}$ by "aRb if and only if a-b is divisible by 5" for $a, b \in \mathbb{Z}$. Verify whether R is an equivalent relation.

   f) Give an example of a relation R on $\mathbb{Z}$ such that R is symmetric and transitive but not reflexive with justification.

   g) Define a lattice and give an example with justification.

   h) Prove for the sets U and V that $U \subseteq V$ if and only if $U \cup V = V$.

2. Answer any **five** questions: 5×5=25

   a) Lat A be a statement form in which the statement variables $p_1, p_2, \ ,p_n$ appear, and let $A_1, A_2, ..., A_n$ be statement forms. If A is a tautology, then show that the statement form B, obtained from A by replacing each occurrence of p_i by A_i $(1 \leq i \leq n)$ throughout, is also a tautology .

   b) Prove or disprove that *(~(pq))* is logically equivalent to *((~p)(~q))*.

   c) If B_1 is a statement form arising from the statement form A_1 by substituting the statement form B for one or more occurrence of the statement form A in A_1, and if B is logically equivalent to A, then prove that B_1 is logically equivalent to A_1.

d) Show that the pairs $\{\sim, \}$, $\{\sim, \}$ and $\{\sim, \rightarrow\}$ are adequate sets of connectives.

e) Let R be an equivalence relation on a set S and $a,b \in S$. Then prove that Cl(a)=Cl(b) if and only if aRb.

f) For any sets A, B and C, prove $A\Delta(B\Delta C) = (A\Delta B)\Delta C$.

g) Define a poset with an example. Let $(S, \leq)$ be a poset. If $a, b \in S$ have a least upper bound, then show that it is unique.

h) For any sets A, B and C prove $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ and $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.

OPTION - B

MATH-H-SEC-T-1B

1. Answer any **five** questions: 3×5=15

a) Explain the use of graphics API.

b) What are the drawbacks of vector scan?

c) How many types of LCDs are there? Briefly discuss.

d) Differentiate between orthographic and oblique parallel projection.

e) List the properties of Bezier Curves.

f) Briefly explain perspective projection technique.

g) Explain the concept of vanishing point with example.

2. Answer any **five** questions: 5×5=25

a) Explain the working principle of CRT display.

b) What is random scan? What is the size of the frame buffer of a system with resolution 640×480 to store 12 bits per pixel? 2+3

c) Explain the Bresenham's Line drawing algorithm.

d) Explain an algorithm for polygon clipping.

e) A triangle is defined with co-ordinates A(20,10), B(60,10) and C(30,70). Write the co-ordinates of the vertices after each of the following transformations. Do all the transformations on the original triangle.

i) Scale the triangle about vertex A with scaling factors $S_x=2$ and $S_y=1/2$.

ii) Reflect the triangle about the line y=x.

3+2

f) Write a short note on raytracing.

g) Discuss some applications of computer graphics.

———————