U.G. 3rd Semester Examination 2021

MATHEMATICS (General)

Paper : SEC-1

[Number Theory & Boolean Algebra]

(CBCS)

Full Marks : 32 Time : 2 Hours

The figures in the margin indicate full marks.
Notations and symbols have their usual meanings.

Group - A

(4 Marks)

1. Answer any ***four*** questions : 4×1=4

   (a) Prove that $n(n+1)(n+2)$ where $n \in z$ is divisible by 6.

   (b) Prove that if $a \equiv b \pmod{m}$ and $b \equiv c \pmod{m}$ then $a \equiv c \pmod{m}$.

   (c) State Fermats little Theorem.

   (d) If $2x \equiv 1 \pmod{21}$ then find the value of x?

   (e) In Boolean algebra prove that $a + ab = a$.

   (f) Define sublattices.

   (g) Define minimal and maximal forms of Boolean polynomials.

Group - B

(10 Marks)

Answer any ***two*** questions : 2×5=10

2. Show that Congruence is an equivalence relation. 5

3. Use Euclid's algorithm to establish that the cube of any integer is of the form $9k$, $9k+1$ or $9k+8$; for some $k \in \mathbb{Z}$. 5

4. Change the following to disjunctive normal form, $(x'+y'+z)(x+y'+z')(x'+y+z')$. 5

5. Construct the truth table for the Boolean expression of $(x'+y'+z')'+x'+y'$. 5

Group - C

(18 Marks)

Answer any *two* questions : 2×9=18

6. What is ISBN? Find the check digit of the following ISBN assuming it is valid 81-7468-245-x. 9

7. (a) State and prove fundamental theorem of arithmetic. 7

   (b) Justify whether there exists integral solution of the equation $91m + 63n = 6$ or not? 2

8. (a) Find the remainder when $1! + 2! + 3! + \ldots\ldots + 100!$ is divided by 12. 4

   (b) Describe a systematic method of arranging files using Hashing functions. 5