

Roll No

CS/IT-302 (GS)**B.E. III Semester** Examination, June 2020**Grading System (GS)****Discrete Structure***Time : Three Hours**Maximum Marks : 70*

- Note:** i) Attempt any five questions.
ii) All questions carry equal marks.

1. Let $A = \{2, 3, 4\}$ and $B = \{3, 4, 5, 6, 7\}$. Assume a relation R from A to B such that $(x, y) \in R$ when a divides 6 . Determine R , its domain and range.
2. If A be the set of all triangles in a plane and $R = \{(a, b) : \Delta a = \Delta b\}$, i.e. $aRb \leftrightarrow \text{area of the triangle } a = \text{Area of the triangle } b$, then prove that R is an equivalence relation.
3. Let $A = B = C = \mathbb{R}$, and Let $f: A \rightarrow B$, $g: B \rightarrow C$ be defined by $f(a) = a + 1$ and $g(b) = b^2 + 2$, find
 - i) $(g \circ f)(-2)$
 - ii) $(f \circ g)(x)$
 - iii) $(g \circ g)(y)$
 - iv) $(g \circ f)(x)$
4. If A , B and C are any three sets, prove that :
 - i) $A - (B \cap C) = (A - B) \cup (A - C)$
 - ii) $A - (B \cup C) = (A - B) \cap (A - C)$
5. Among integers 1 to 300, how many of them are divisible neither by 3, nor by 5, nor by 7? How many of them are divisible by 3 but not by 5, nor by 7?
6. State Euler's formula for a planar graph. Give an example of a planar graph with 5 vertices and 5 regions and verify Euler's formula for your example.

OR

Show that the maximum number of edges in simple graph with n vertices is $\frac{n(n-1)}{2}$

7. Which of the following formulas are tautologies? Explain what is meant by "tautology" and write down truth tables to justify your answers.
 - i) $p \Rightarrow q$
 - ii) $(p \Rightarrow q) \Rightarrow p$
 - iii) $((p \Rightarrow q) \Rightarrow p) \Rightarrow p$

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OR

Solve the recurrence relation:

$$a_r - 7a_{r-1} + 10a_{r-2} = 0 \text{ given } a_0 = 0 \text{ and } a_1 = 6$$

8. Write the short notes. (any two)
- a) Graph Coloring
 - b) Types of functions
 - c) Recurrence relation
 - d) Conjunctive and Disjunctive Normal Form
 - e) Lattice
