**VASAVI COLLEGE OF ENGINEERING(Autonomous) IBRAHIMBAGH, HYDERABAD-500031**

**B.E., III - Semester (2022-23) ASSIGNMENT- I**

**Subject: DISCRETE STRUCTURES BRANCH: CSE-A**

**Last date of Submission: 03.12.2022 Date: 30.11.2022**

1. Show that [𝑝 ⋀(𝑝 → 𝑞)] → 𝑞 is a tautology without using truth tables.

2. Let P(x) : x is a professor, Q(x): x is ignorant and R(x): x is vain respectively. Express each of the following statements using quantifiers and logical connectives.

* 1. No professors are ignorant.
  2. All ignorant people are vain.
  3. No professors are vain.

3. Use the Euclidean algorithm and find *gcd (3457,4669)* and express it as a linear

combination of these.

4. What is meant by direct proof? Use it to prove that the sum of two odd integers is even

5. Show that [(𝑝 ⋀ 𝑞) → (𝑝 → 𝑞)] is a tautology without using truth tables.

6. Express each of the following statements using quantifiers.

* 1. There is no dog that can talk.
  2. There is no one in this class who knows French and Russian.
  3. Every student in this class has taken exactly two mathematics classes at this college.
  4. Someone has visited every country in the world except Libya.
  5. No one has climbed every mountain in the Himalayas.

7. Show that [(𝑝 ⋁𝑞) ⋀(𝑝 → 𝑟) ⋀(𝑞 → 𝑟)] → 𝑟 is a tautology.

8. Use quantifiers to express the following:

* 1. Every computer science student needs a course in discrete mathematics.
  2. There is a student in this class who owns a personal computer.
  3. Every student in this class has taken atleast one computer science course.
  4. Every student in this class has been in atleast one room of every building on campus.

9. Show that [(𝑝 → 𝑞) ⋀(𝑞 → 𝑟)] → (𝑝 → 𝑟) is a tautology.

10. Verify whether ( → 𝑞) → 𝑟 𝑎𝑛𝑑 𝑝 → (𝑞 → 𝑟) are equivalent.

11. Express the following into symbolic form and then form the negation of the statement:

* 1. No one has lost more than one thousand dollars playing the lottery.
  2. There is a student in this class who has chatted with exactly one other student.
  3. No student has solved atleast one exercise in this book.

12. Verify whether (𝑝 ↔ 𝑞) 𝑎𝑛𝑑 (𝑝⋀𝑞)⋁(∽ 𝑝 ⋀ ∽ 𝑞) are equivalent.

# 13. Which of the following are not equivalent? ( )

a. 𝑝 ↔ 𝑞 𝑎𝑛𝑑 (𝑝 ∧ 𝑞) ∨ (∼ 𝑝 ∧ ∼ 𝑞)

# b. (𝑝 → 𝑞) → 𝑟 𝑎𝑛𝑑 𝑝 → (𝑞 → 𝑟)

c. ∼ 𝑝 ↔ 𝑞 𝑎𝑛𝑑 𝑝 ↔ ∼ 𝑞

# d. ∼ ( 𝑝 ↔ 𝑞 ) 𝑎𝑛𝑑 ∼ 𝑝 ↔ 𝑞

14.Determine whether the implication [( ⋁ 𝑞) ⋀ (𝑝 → 𝑟)⋀(𝑞 → 𝑟)] → 𝑟 is a tautology.

15. Verify whether (𝑝 ↔ 𝑞) 𝑎𝑛𝑑 (𝑝⋀𝑞)⋁(∽ 𝑝 ⋀ ∽ 𝑞) are equivalent.

16. Use mathematical induction to show that 5 divides 𝑛5 − 𝑛 when 𝑛 is a non-negative integer.

17.Use the Euclidean algorithm and find *gcd(11111,111111)* and express it as a linear combination of these.

18. Write the following statements in symbolic form and negate them

* 1. There exists a matrix whose transpose is itself
  2. Every element of a group has inverse
  3. At least one parallelogram is a rhombus

19. Let *m*  be a positive integer and *a, b, c*  are integers.

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20. Prove that is irrational.

21. Prove that if *n* is a positive integer, then *n* is even if and only if 7n+4 is even.

22. Express the following into symbolic form:

1. Babies are illogical
2. Nobody is despised who can manage a crocodile.
3. Illogical persons are despised
4. Babies cannot manage crocodiles.

23. Show that 937 is an inverse of 13 modulo 2436.

24. Prove that the square of an even number is an even number using an indirect proof.

25. Let *m*  be a positive integer and *a,b,c*  are integers.

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Details of Batches and corresponding question numbers to be answered.

**CSE-A**

| **Batch No.** | **Roll numbers(Each Batch contains 12 students)** | **Question numbers** |
| --- | --- | --- |
| 1 | 1602-21—733-001-010, 301,62,135 | 1-4,25 |
| 2 | 1602-21—733-011-020,302, 63,136 | 5-8,25 |
| 3 | 1602-21—733-021-030,303, 64 | 9-12,25 |
| 4 | 1602-21—733-031-040,304, 65 | 13-16,25 |
| 5 | 1602-21—733-041-050,305, 66 | 17-20,25 |
| 6 | 1602-21—733-051-061,306 & 307,67 | 21-24,25 |