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MTH202 Assignment 1 Solution - Zubaida Shafique

Fall 2026

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MTH202: Discrete Structures

Assignment No. 1 — Fall 2026 | Total Marks: 20

Section Incharge: Zubaida Shafique

Lectures 1 to 10. Due Date: 12 November 2026.

Question 1 (a) (2.5 Marks)

Premise 1: p ∧ q. Premise 2: p ∨ q. Conclusion: p. Check whether the argument is valid.

p	q	p ∧ q	p ∨ q	p
True	True	True	True	True
True	False	False	True	True
False	True	False	True	False
False	False	False	False	False

The first premise p ∧ q is true only when p and q are both true. The second premise p ∨ q is also true in that row. The conclusion p is true in the same row. No row makes both premises true and the conclusion false. So the argument is valid.

Question 1 (b) (2.5 Marks)

Premise 1: q → p. Premise 2: p. Conclusion: q. Check whether the argument is valid.

p	q	q → p	p	q
True	True	True	True	True
True	False	True	True	False
False	True	True	False	True
False	False	True	False	False

Take the row p True and q False. In this row q → p is True and p is True, so both premises hold. But the conclusion q is False. A row with true premises and a false conclusion exists, so the argument is invalid.

Question 2 (5 Marks)

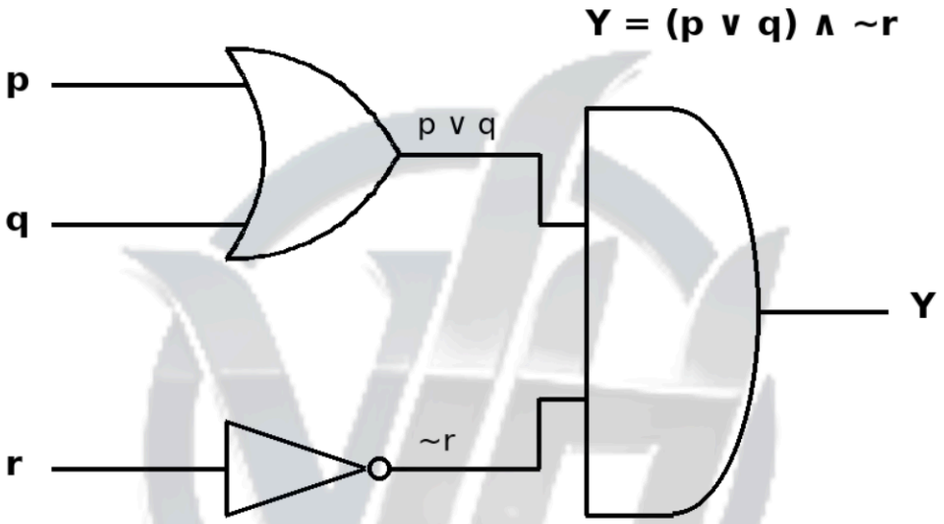
If p → q is FALSE, determine the truth value of ~(p ∧ q) → ~q.

p → q is false in one case only: p True and q False. Put p True and q False. Then p ∧ q is False, so ~(p ∧ q) is True. And ~q is True, since q is False. So the statement becomes True → True, which is True.

Question 3 (5 Marks)

Draw the logic circuit for Y = (p ∨ q) ∧ ~r.

The circuit has an OR gate, a NOT gate and an AND gate. The OR gate joins p and q. The NOT gate flips r. The AND gate joins the two results, and its output is Y. So Y = (p ∨ q) ∧ ~r.



Question 4 (5 Marks)

Which of the following sentences are propositions? What are the truth values of those that are propositions?

A sentence is a proposition when it is a statement that is either true or false, not both.

No.	Sentence	Proposition or Not	Truth Value	Why
1	4 + 3 = 7	Proposition	True	4 + 3 is 7.
2	6 + 2 = 9	Proposition	False	6 + 2 is 8, not 9.
3	x + 3 = 8	Not a Proposition	-	The value of x is not known, so the sentence has no fixed truth value.
4	x + 2 = 6, if x = 4	Proposition	True	With x = 4, x + 2 is 6.
5	Open the door.	Not a Proposition	-	It is a command, not a statement.
6	6 × 2 = 12	Proposition	True	6 × 2 is 12.