Answer all in the given sequence. All question having same marks **Max.Marks (10)**

Seat /ID	Discrete Structure (CS1005)	Section: BCS-3J
Date: 04-09-2024	Quiz-1	Time: 30 mints

Q1 Let p, q, and r be the propositions

p: You have the flu.
q: You miss the final examination.
r: You pass the course.

Express each of these propositions as an English sen tence.

a) $p \rightarrow q$ **b)** $\neg q \leftrightarrow r$
c) $q \rightarrow \neg r$ **d)** $p \vee q \vee r$

Q2(a) Translate the following proposition into logical expression.

"You can access the Internet from campus only if you are a computer science major or you are not a freshman."

(b) Use truth table for given statement is a tautology, contradiction or contingency

$[\neg p \wedge (p \vee q)] \rightarrow q$

Q3 Write Contrapositive , converse and Inverse of the following proposition

" If Howard can swim across the lake, then Howard can swim to the island. "

Q4 Show that by using law of logical equivalence, justify each steps

$\neg(\neg p \wedge q) \wedge (p \vee q) \equiv p.$

Q5 Determine the validity of the following argument using truth table

p ∨ q
p → ~q
p → r
∴ r

ALL THE BEST

Answer all in the given sequence. All question having same marks Max.Marks (10)

Solution-1

a) If you have the flu, then you miss the final exam.

b) You do not miss the final exam if and only if you pass the course.

c) If you miss the final exam, then you do not pass the course.

d) You have the flu, or miss the final exam, or pass the course.

Solution-2(a)

Let p = "You can access the Internet from campus,"

q= "You are a computer science major,"

r= "You are a freshman."

$$p \rightarrow (q \vee \neg r)$$

Solution- 2(b) Given proposition is Tautology

p	q	$\neg p$	$p \vee q$	$\neg p \wedge (p \vee q)$	$[\neg p \wedge (p \vee q)] \rightarrow q$
T	T	F	T	F	T
T	F	F	T	F	T
F	T	T	T	T	T
F	F	T	F	F	T

Solution-3

contrapositive If Howard cannot swim to the island, then Howard cannot swim across the lake.

Converse: If Howard can swim to the island, then Howard can swim across the lake.

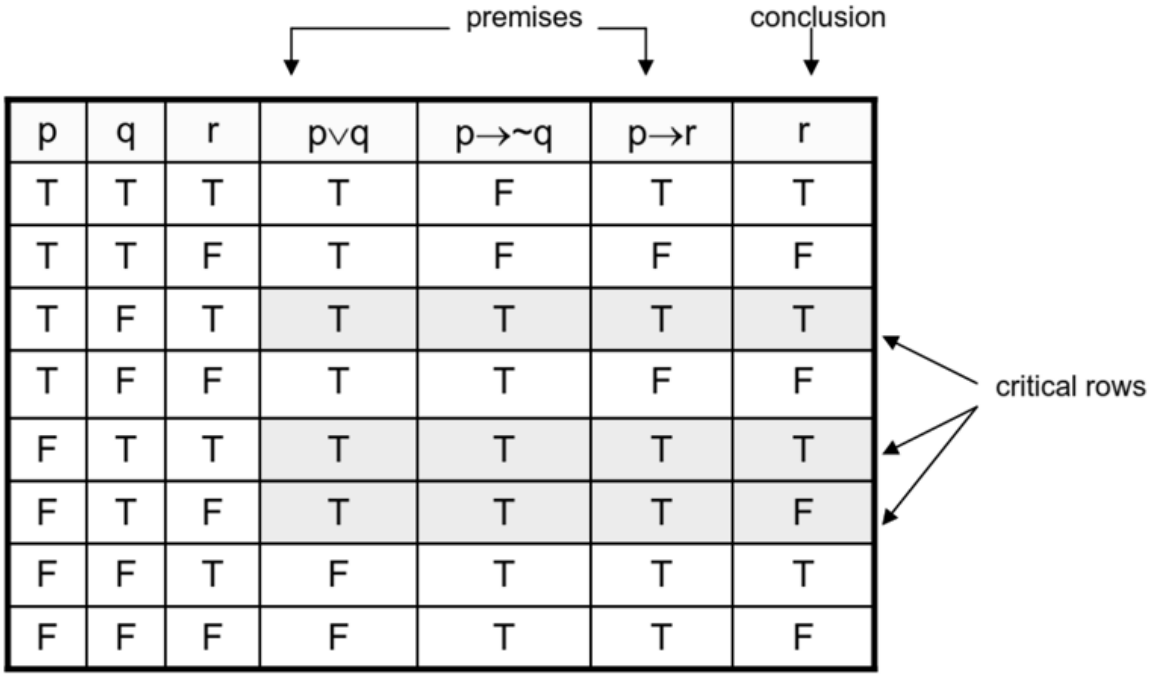
Inverse: If Howard cannot swim across the lake, then Howard cannot swim to the island.

Solution-4

$$\begin{aligned}
\sim(\sim p \wedge q) \wedge (p \vee q) &\equiv (\sim(\sim p) \vee \sim q) \wedge (p \vee q) && \text{by De Morgan's laws} \\
&\equiv (p \vee \sim q) \wedge (p \vee q) && \text{by the double negative law} \\
&\equiv p \vee (\sim q \wedge q) && \text{by the distributive law} \\
&\equiv p \vee (q \wedge \sim q) && \text{by the commutative law for } \wedge \\
&\equiv p \vee \mathsf{F} && \text{by the negation law} \\
&\equiv p && \text{by the identity law.}
\end{aligned}$$

Answer all in the given sequence. All question having same marks **Max.Marks (10)**

Solution-5



p	q	r	p∨q	p→~q	p→r	r
T	T	T	T	F	T	T
T	T	F	T	F	F	F
T	F	T	T	T	T	T
T	F	F	T	T	F	F
F	T	T	T	T	T	T
F	T	F	T	T	T	F
F	F	T	F	T	T	T
F	F	F	F	T	T	F

The argument form is invalid