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

Seat /ID	Discrete Structure (CS1005)	Section: BSE2A
Date: 14-2-2024	Quiz-1	Time: 30 mints

Let p, q, and r be the propositions

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

Q1(i) 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)** $p \vee q \vee r$

Q1(ii) Write these propositions using p, q, and r and logical con·nectives (including negations).

a) It is either the case that if you have the flu then you do not pass the course, or if you miss the final exam then you do not pass the course

b) Either you have the flu and miss the final exam, or you do not miss the final exam and do pass the course.

Q 2 Write Contrapositive , converse and Inverse of the following proposition

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

Q3 Use truth table for the given statement is a tautology, contradiction or contingency

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

Q4 Show that (any one) by using law of logical equivalence, justify each steps

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

(b) $(p \vee q) \rightarrow \neg p \equiv \neg p$

Q5 use truth table

Determine the validity of the following argument:

If 7 is less than 4, then 7 is not a prime number.
7 is not less than 4.

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7 is a prime number.

Course Teacher: Assistant Prof: Jamilusmani

ALL THE BEST

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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.

a) $(p \to \neg r) \vee (q \to \neg r)$ **b)** $(p \wedge q) \vee (\neg q \wedge r)$

Solution-2

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

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-3 **Tautology**

Solution-4

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

b)
$$\begin{aligned}
(p \vee q) \to \neg p &\equiv \neg(p \vee q) \vee \neg p && \text{by the conditional-disjunction equivalence} \\
&\equiv (\neg p \wedge \neg q) \vee \neg p && \text{by the second De Morgan's law} \\
&\equiv \neg p && \text{by the first absorption law}
\end{aligned}$$

Solution-5

First translate the argument into symbolic form.

Let p be "7 is less than 4" and q be "7 is a prime number."

IT IS NOT VALID

Premises

p	q	$\neg q$	$p \to \neg q$	$\neg p$
T	T	F	F	F
T	F	T	T	F
F	T	F	T	T
F	F	T	T	T

critical row

conclusion