MANIPAL UNIVERSITY JAIPUR

(University under Section 2(f) of the UGC Act)

B.TECH SECOND YEAR

ACADEMIC YEAR: 2020-2021

COURSE NAME: ENGINEERING MATHEMATICS-III

COURSE CODE : MA 2101

LECTURE SERIES NO : 27 (TWENTY-SEVEN)

CREDITS : 3

MODE OF DELIVERY : ONLINE (POWER POINT PRESENTATION)

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MANIPAL UNIVERSITY JAIPUR

VISION

Global Leadership in Higher Education and Human Development

MISSION

- Be the most preferred University for innovative and interdisciplinary learning
- Foster academic, research and professional excellence in all domains
- Transform young minds into competent professionals with good human values

VALUES

Integrity, Transparency, Quality,
Team Work, Execution with Passion, Humane Touch

SESSION OUTCOME

" TO UNDERSTAND THE BASICS OF PROPOSITIONS"

ASSIGNMENT

QUIZ

MID TERM EXAMINATION –I & II

END TERM EXAMINATION

ASSESSMENT CRITERIA'S

PROGRAM OUTCOMES MAPPING WITH CO5

[PO1]

ENGINEERING KNOWLEDGE: APPLY THE KNOWLEDGE OF MATHEMATICS, SCIENCE, ENGINEERING FUNDAMENTALS, AND AN ENGINEERING SPECIALIZATION TO THE SOLUTION OF COMPLEX ENGINEERING PROBLEMS.

Propositional Calculus

Proposition

A proposition is a statement which is either true or false. It is a declarative sentence.

Ex. 1 Dr. G. K. Prabhu is the president of Manipal University Jaipur.

Ex. 2 It rained yesterday.

Ex. 3 If x is an integer then x^2 is a positive integer.

Following are not propositions-

Ex. 4 Please give me that book.

Ex. 5 What is your name?

Ex. 6 $x^2 = 8$

Propositional Variables

Normally, the lower-case letters p, q, r,… are used to represent propositions. e.g.

p: India is in Europe

q: $2 + 2 = 4$

Combination of Propositions

We can combine the propositions to produce new propositions.

There are three fundamental connectors-

a) Conjunction
b) Disjunction
c) Negation

There are three derived connecters

a) NAND
b) NOR
c) XOR

Conjunction (∧)

It means AND-ing of two statements.

Let p and q are two propositions, Conjunction of p and q be a proposition which is true when both p and q are true otherwise false. It is denoted by $p \wedge q$. The truth table for conjunction of p and q can be constructed as follows

p	q	$p \wedge q$
T	T	T
T	F	F
F	T	F
F	F	F

Disjunction (V)

It means OR-ing of two statements.

Let p and q are two propositions, disjunction of p and q be a proposition which is true when atleast one of p and q is true and false when both are false. It is denoted by $p \vee q$. The truth table for disjunction of p and q can be constructed as follows

p	q	$p \vee q$
T	T	T
T	F	T
F	T	T
F	F	F

Negation (~or¬)

It means opposite of original statement.

Let p be a proposition, the negation of p be a proposition which is true when p is false, and is false when p is true. For negation of a proposition, we can construct the truth table as follows

p	$\neg p$
T	F
F	T

NAND

It means negation after AND-ing of two statements.

Let p and q are two propositions, NAND of these two propositions is a proposition which is false when both p and q are true, otherwise true. It is denoted by $\sim(p \wedge q)$ or $p \uparrow q$. For NAND, we can construct the truth table as follows

$\boldsymbol{p}$	$\boldsymbol{q}$	$p \uparrow q$
T	T	F
T	F	T
F	T	T
F	F	T

NOR

It means negation after Or-ing of two statements.

Let p and q are two propositions, NOR of these two propositions is a proposition which is true when both p and q are false, otherwise false. It is denoted by $\sim(p \vee q)$ or $p \downarrow q$. For NOR, we can construct the truth table as follows

$\boldsymbol{p}$	$\boldsymbol{q}$	$p \downarrow q$
T	T	F
T	F	F
F	T	F
F	F	T

XOR

Let p and q be two propositions, XORing of p and q is true if p is true or q is true but not both and vice versa. It is denoted by $p \oplus q$ and the truth table can be constructed as

p	q	$p \oplus q$
T	T	F
T	F	T
F	T	T
F	F	F

Some Other Connectors

Conditional or Implication

- $p \rightarrow q$

Biconditional or Equivalence

- $p \leftrightarrow q$

Conditional or Implication

Statements of the form “If p then q” are called conditional statements.

It is denoted as $p \rightarrow q$ and read as “p implies q” or “q is necessary for p” or “p is sufficient for q”.

Conditional statement is true if both p and q are true or if p is false. It is false if p is true and q is false. The truth table for implication is as

p	q	$p \rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

Thanks for your attention!!