



**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

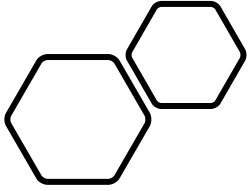
MID TERM EXAMINATION –I & II

END TERM EXAMINATION

# ASSESSMENT CRITERIA'S

# PROGRAM OUTCOMES MAPPING WITH CO5

**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 connectors

- a) NAND
- b) NOR
- c) XOR



# Conjunction ( $\wedge$ )

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 ( $\vee$ )

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 ( $\sim$ or $\neg$ )

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

$p$	$q$	$p \uparrow q$
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

$p$	$q$	$p \downarrow q$
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!!

