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 : 31 (THIRTY-ONE)

CREDITS : 3

MODE OF DELIVERY : ONLINE (POWER POINT PRESENTATION)

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PROPOSED DATE OF DELIVERY: 16 OCTOBER 2020

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

"UNDERSTAND THE CONCEPT OF QUANTIFIERS AND THEIR USES TO EXPRESS SENTENCES"

ASSIGNMENT

QUIZ

MID TERM EXAMINATION –I & II

END TERM EXAMINATION

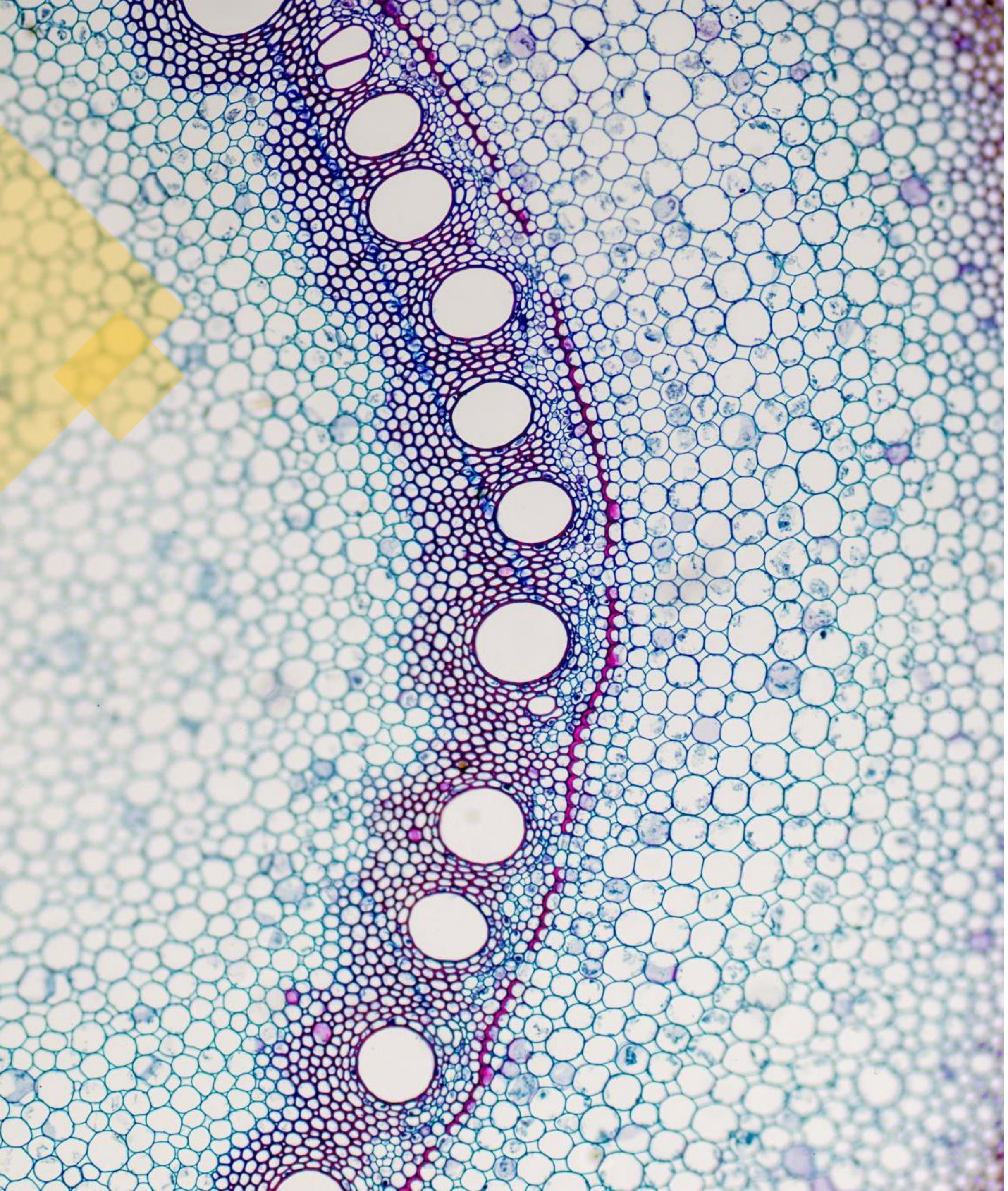
ASSESSMENT CRITERIA'S

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.

Quantifiers



Quantifiers

Quantification is a technique to create a statement from a proposition and Quantifiers are those with the help of which, the statement can be created.

There are two types of quantifiers-

1. Universal Quantifier (∀)
2. Existential Quantifier (∃)

Universal Quantifier

The universal quantification of a predicate $P(x)$ is the statement

"$P(x)$ is true for all values of x in the universe of discourse"

The notation $\forall x P(x)$ or $(x)P(x)$ denotes the universal quantification of $P(x)$. The symbol $\forall$ is called the universal quantifier.

The statement $\forall x P(x)$ can also be stated as "for every $xP(x)$" or "for all $xP(x)$".

Existential Quantifier

The existential quantification of a predicate $P(x)$ is the statement

"There exists an element x in the universe of discourse for which $P(x)$ is true."

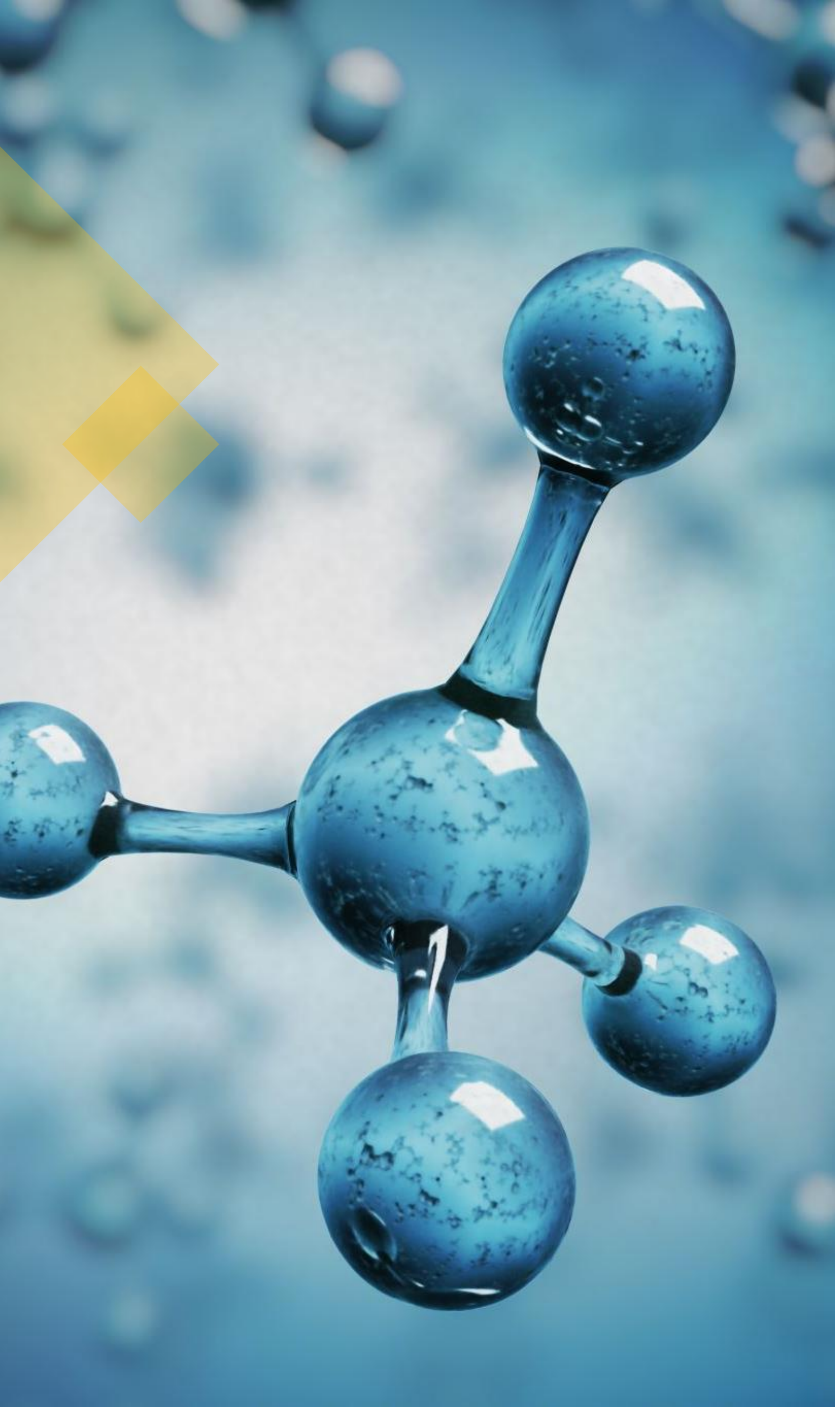
The notation $\exists x P(x)$ denotes the existential quantification of $P(x)$ and the symbol $\exists$ is called the existential quantifier.

The statement $\exists x P(x)$ can also be stated as

"There is a x such that $P(x)$"

or "for some $x, P(x)$".

or " There exists a x such that $P(x)$"



Properties of Quantifiers

1. $\sim(\forall x P(x)) \equiv \exists x \sim P(x)$
2. $\sim\big(\exists x \sim P(x)\big) \equiv \forall x \sim P(x)$
3. $\exists x\big(P(x) \rightarrow Q(x)\big) \equiv \forall x P(x) \rightarrow \exists x Q(x)$
4. $\exists x Q(x) \rightarrow \forall x Q(x) \equiv \forall x\big(P(x) \rightarrow Q(x)\big)$
5. $\exists x\big(P(x) \vee Q(x)\big) \equiv \exists x P(x) \vee \exists x Q(x)$
6. $\sim\big(\exists x \sim P(x)\big) \equiv \forall x P(x)$

Ex1. Let P(x, y): x is taller than y, then express the following statement using quantifiers.

If x is taller than y, then y is not taller than x.

Sol. The related proposition is $P(x,y) \rightarrow \sim P(y,x)$

As this assertion is true, so it can be represented as

$$\forall x \forall y (P(x,y) \rightarrow \sim P(y,x))$$

Ex2. Let P(x): x has studied computer programming. Express the following with the help of quantifiers

(i) Every student in the class has studied computer programming.

(ii) There is a student in the class who has not studied computer programming.

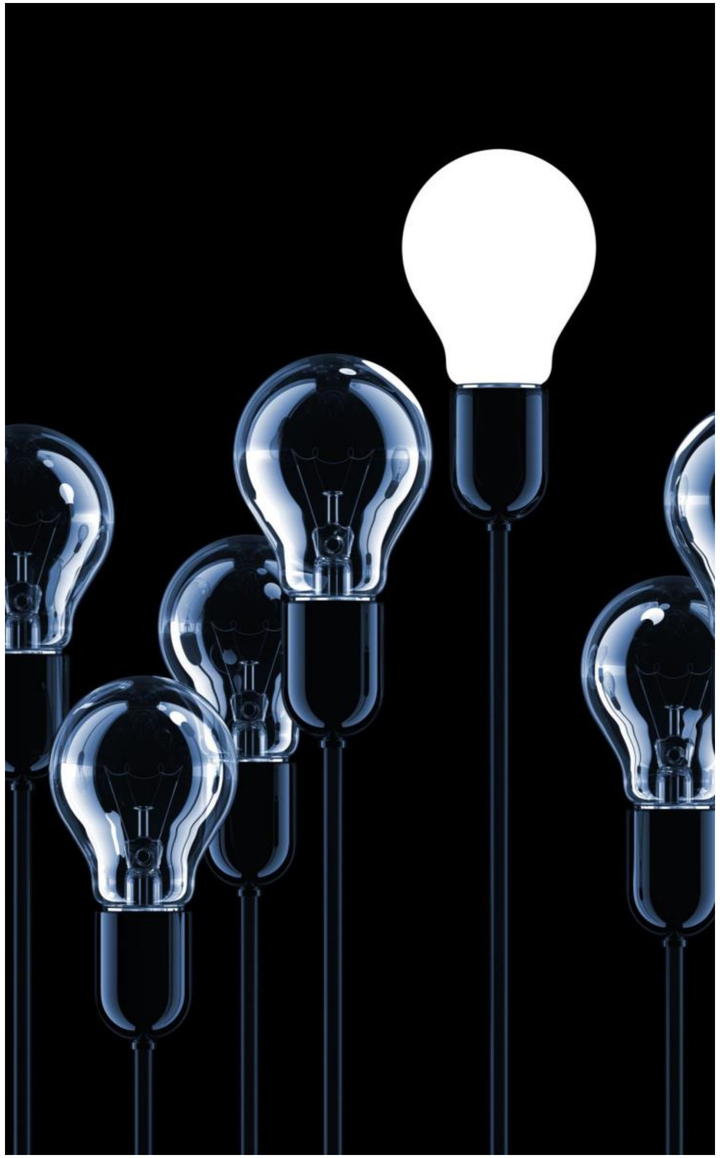
Sol. (i) $\forall x P(x)$ (ii) $\exists x \sim P(x)$ or $\sim [\exists x P(x)]$

Ex3. Translate the statement $\forall x(C(x) \vee \exists y(C(y) \wedge F(x, y)))$ into English, where

$C(x)$: "x has a computer" , $F(x, y)$: "x and y are friends"

and the universe of discourse for both x and y is the set of all students in our university.

Sol. Every student in our university has a computer or has a friend who has a computer.



Thanks for your attention!!