Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI EXAMINATION – SUMMER 2025

Subject Code: 3161921 **Date: 30-05-2025**

Subject Name: Machine Tool Design

Time: 10:30 AM TO 01:00 PM **Total Marks:70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	State the functions of the spindle unit with their application in machine tool	**03**
	(b)	Explain the basic types of machine tools and their constructional features.	**04**
	(c)	Prove that the loss of economic cutting speed is constant over the whole range of spindle speed in GP series	**07**
Q.2	**(a)**	What is the role of adaptive control systems in modern machine tools?	**03**
	(b)	Explain the step by step procedure for constructing structure diagram for speed box.	**04**
	(c)	Explain hydraulic step less regulation of speed and feed rates	**07**
		OR	
	(c)	What are the principles behind speed and feed regulation in machine tools? How do these impact the overall performance of the machine?	**07**
Q.3	**(a)**	What is a Ray Diagram in gearbox design, and how is it used?	**03**
	(b)	Discuss various shapes of slide ways and justify their application for machine tools	**04**
	(c)	Explain the factors affecting stiffness of machine tool structure and methods of improving it	**07**
		OR	
Q.3	**(a)**	What is a speed gearbox, and why is it important in machine tools?	**03**
	(b)	Illustrate anti friction guideways	**04**
	(c)	Describe step by step procedure for the design of 8 speed gearbox for a lathe, giving governing design equations	**07**
Q.4	**(a)**	State the different applications of guideways in machine tool design	**03**
	(b)	State the functions and requirements of the spindle unit along with the materials.	**04**
	(c)	Explain the design of rolling friction power screws	**07**
		OR	
Q.4	**(a)**	What are the primary motions in machine tools?	**03**
	(b)	Explain the factors affecting on design of sliding-friction power screws	**04**
	(c)	Explain factors affecting stiffness of machine tool structure and methods to improve it	**07**
Q.5	**(a)**	Define the concept of feed rate in the context of machine tools.	**03**
	(b)	Draw general layout of knee type vertical milling machine with relative motion	**04**
	(c)	Write a note on machine tool chatter	**07**
		OR	
Q.5	**(a)**	How does spindle stiffness affect machining accuracy?	**03**
	(b)	Explain simple centralized control system for speed changing	**04**
	(c)	What are the methods to reduce instability in machine tools	**07**