Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2022

Subject Code:3161921 Date:10/06/2022

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.**

			MARKS
Q.1	**(a)**	Differentiate between hydraulic transmission and mechanical transmission.	**03**
	(b)	List types of feed boxes and explain any one with neat sketch.	**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)**	Write advantages of geometrical progression.	**03**
	(b)	Explain hydraulic step less regulation of speed and feed rates.	**04**
	(c)	Explain the step by step procedure for constructing structure diagram for speed box.	**07**
		OR	
	(c)	Draw speed diagram and layout for a six speed gear box having the following structural formulae: (i) 2(3) 3(1) (ii) 2(1) 3(2) The output sppeds are 160 rpm minimum and 1000 rpm maximum. The motor shaft speed is 1440 rpm.	**07**
Q.3	**(a)**	Give functions of machine tool structures and their requirements.	**03**
	(b)	Explain the factors affecting stiffness of machine tool structure and methods of improving it.	**04**
	(c)	Explain in details static and dynamic stiffness for machine tool structures.	**07**
		OR	
Q.3	**(a)**	With suitable figure show various profiles of slide ways.	**03**
	(b)	Illustrate anti friction guideways.	**04**
	(c)	Give requirement of Protecting devices for slide ways and explain various types of protecting devices with neat sketch.	**07**
Q.4	**(a)**	What is spindle? Explain functions of spindle unit.	**03**
	(b)	Enlist the material for spindles.	**04**
	(c)	Explain the design of rolling friction power screws.	**07**
		OR	
Q.4	**(a)**	what are the commonly used bed sections and wall arrangements.Also state its applications.	**03**
	(b)	Explain the factors affecting on design of sliding-friction power screws.	**04**
	(c)	The rolling contact ball bearing are to be selected to support the overhung countershaft. The shaft speed is720 r.p.m. The bearings are to have 99% reliability corresponding to a life of 24 000 hours. The bearing is subjected to an equivalent radial load of 1 kN. Consider life	**07**

adjustment factors for operating condition and material as 0.9 and 0.85 respectively.
Find the basic dynamic load rating of the bearing from manufacturer's catalogue, specified at 90% reliability.

Q.5	**(a)**	What are the aesthetics considerations applied to design of machine tools.	**03**
	(b)	Write a note on machine tool chatter.	**04**
	(c)	Explain the adaptive control system for machine tools.	**07**

OR

Q.5	**(a)**	Explain simple centralized control system for speed changing.	**03**
	(b)	What are the methods to reduce instability in machine tools.	**04**
	(c)	Explain the ergonomic consideration applied to the design of control members of machine tools.	**07**

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