

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VIII (NEW) EXAMINATION – WINTER 2023

Subject Code:2182503

Date:06-12-2023

Subject Name:Design of Product and Machine Tools

Time:02:30 PM TO 05:00 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.
5. Use of PSG Design Data Book is permitted

		MARKS	
Q.1	(a) Explain structure of Product Design.	03	
	(b) Discuss Requirements of Machine Tool Design	04	
	(c) Design a gear box for a Lathe machine having maximum and minimum speeds are 720 and 18 rpm respectively. Number of spindle speeds are 12 and drive is from an electric motor having 2.5 KW and 1440rpm. Calculate No. of spindle speeds, draw structural diagram and speed chart.	07	
Q.2	(a) State the classification of Speed and Feed box.	03	
	(b) Discuss economic evaluation of design.	04	
	(c) Explain need for speed regulation.	07	
OR			
Q.3	(c) Discuss source and effects of vibration.	07	
	(a) State different materials used for machine tool spindle with advantages and disadvantages.	03	
	(b) Give the detailed classification of bearings.	04	
Q.3	(c) Details of full hydrodynamic bearing are given below: Load on bearing: 13000N, Length of Bearing: 75 mm, Diameter of Bearing: 75 mm, Speed of Journal: 1800 rpm, Clearance Ratio: 1×10^{-3} , Viscosity of Oil: 10×10^{-3} Kg/m. s., Determine: Minimum film thickness, Co-efficient of friction and Power loss in friction.	07	
	OR		
	(a) Give functions and requirements of spindle unit.	03	
Q.3	(b) Differentiate between hydrostatic and hydrodynamic bearings.	04	
	(c) A ball bearing for a drilling machine spindle is rotating at 3500 rpm. It is subjected to a radial load of 200 kg and an axial load of 100 kg. It is to work 45 hours/week for one year. Select suitable ball bearing if the diameter of the spindle is 40 mm.	07	
	Q.4	(a) Differentiate between static and dynamic stiffness.	03
(b) Discuss antifriction guideways.		04	
(c) Explain various types of bed structures with neat sketches.		07	

OR

- Q.4** (a) Give requirements of column structures. **03**
(b) Discuss protecting devices for slideways. **04**
(c) Discuss method of adjusting clearance in slideways with neat sketches. **07**

- Q.5** (a) Classify different types of wire ropes. **03**
(b) Discuss evaluation of preliminary Product Design. **04**
(c) Design a Crane Hook for a capacity of 60KN. The hook is forged from steel having safe normal stress of 12 N/mm². **07**

OR

- Q.5** (a) Which types of hooks generally used in machine tools operation? Justify your answer. **03**
(b) Discuss any one type of stepless regulation of speed. **04**
(c) Design wire rope drum to hoist a load of 15 KN through a lift of 50 m. Assume the ultimate tensile stress in the rope to be 30 N/mm² and drum diameter to be 20 times the diameter of the rope. Take factor of safety as 6. **07**
