Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME SEMESTER II EXAMINATION – SUMMER 2017

Subject Code: 2720903 **Date: 29/05/2017**

Subject Name: Machine Tool Design

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.**

Q.1	**(a)**	Explain about working and auxiliary motions in machine tools.	**07**
	(b)	Design an eight speeds sliding gearbox for a drill press from the following data Minimum speed 80 RPM, maximum speed 900 RPM, motor power = 7.5 KW at 1440 RPM, reduction through V belt drive between motor and input shaft = 1:2 Draw the structural diagram and speed chart.	**07**
Q.2	**(a)**	What is ray diagram? For 2 X 2 gear box transmitting 10 hp power which has a minimum Σ d? Where d is the diameter of shaft. Which has better layout?	**07**
	(b)	Explain aim of speed and feed rate regulation.	**07**
		OR	
	(b)	Explain factors affecting stiffness of machine tool structure and methods to improve it.	**07**
Q.3	**(a)**	A bed subjected to torsional loading is constructed as a closed box-typed structure, while a bed subjected to bending is constructed as an I section. Why? Give mathematical proof to support your conclusion.	**07**
	(b)	Explain the methods of adjusting clearances in slide ways.	**07**
		OR	
Q.3	**(a)**	Explain design of anti-friction guide ways.	**07**
	(b)	Explain design procedure for a spindle of lathe machine.	**07**
Q.4	**(a)**	Explain effect of machine tool compliance on machine accuracy.	**07**
	(b)	Show, with neat sketches, at least two methods of preloading a ball lead screw. Also deduce an expression that the magnitude of preload is normally equal to 1/3 of the total load.	**07**
		OR	
Q.4	**(a)**	Find the total axial load to which a ball screw can be subjected, if 4 mm balls are used with a pitch circle radius of 20 mm. Allowable contact stresses is limited 25000 kg/cm^2 Assuming semicircular thread profile and circuit consists of two threads only and the combined young's modulus E = 2.1 × 10^6 kg/cm^2	**07**
	(b)	Explain about the modular structures used in machine tools.	**07**
Q.5	**(a)**	State the method of realizing pre-selective control system using: (i) Rack and Pinion (ii) Hydraulic Shifting.	**07**
	(b)	Explain the design of power screws.	**07**
		OR	
Q.5	**(a)**	Explain the control systems for changing speed and feeds	**07**
	(b)	Explain the adaptive control systems.	**07**

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