Seat No.: _____ Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – WINTER • 2014

Subject code: 1720805 **Date: 04-12-2014**

Subject Name: Machine Tool Design

Time: 02:30 pm - 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)**	Draw neat sketch of gearing diagram of a universal milling machine. Also explain its working.	**08**
	(b)	Explain the ergonomics consideration in the design for following control members of machine tool. (i) Toggles (ii) Knob (iii) Rotary lever and star wheel.	**06**
Q.2	**(a)**	Design (draw only structural diagram, speed chart and calculate number of teeth on each gears) a gearbox for the following specifications for a drilling machine: Motor Power = 7.5 kW; Gearbox input shaft speed = 300 r.p.m. Maximum speed = 250 r.p.m.; Minimum speed = 100 r.p.m. No. of steps = 9.	**08**
	(b)	Why geometric progression is used for spindle speeds?	**06**
		OR	
	(b)	What are the basic requirements of a machine tool?	**06**
Q.3	**(a)**	Describe various types of cross sections of M/c tools Beds/Columns.	**08**
	(b)	What are functions of spindles, what are their design requirements?	**06**
		OR	
Q.3	**(a)**	Classify the speed boxes used in machine tools. Explain each in brief.	**08**
	(b)	Discuss the methods used for improving rigidity of machine tool structures?	**06**
Q.4	**(a)**	A bed subjected to torsional loading is constructed as a closed box-type structure, while a bed subjected to bending is constructed as an I section. Why ? Give mathematical proof to support your conclusion.	**08**
	(b)	Write down the criteria for selecting anti-friction bearing.	**06**
		OR	
Q.4	**(a)**	List the factor for which power screws are designed. Explain design for any two factors in detail.	**08**
	(b)	List the functions of guideways in machine tools? Explain in brief types of guideways.	**06**
Q.5	**(a)**	Derive an equation for forces acting on the mating surfaces in a combination of two flat guideways in oblique cutting. Also draw a schematic load diagram for the same.	**08**
	(b)	What are feed control devices? Why are they needed? Explain the feed control by using limit switches.	**06**
		OR	
Q.5	**(a)**	Elaborate difference between GPM & CNC m/c tools with respect to (i) spindle design (ii) gear box design (iii) feed unit design (iv) structure design.	**08**
	(b)	List the hydraulic drives used in machine tools and explain any two of them.	**06**

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