GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VIII • EXAMINATION - SUMMER • 2015 Date:13/05/2015

Subject Code: 182503

Subject Name: Design of Product & Machine Tools.

Time: 10.30AM-01.00PM

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- 4. Use of PSG Design Data Book is permitted.
- Design a gear box to give 18 speeds for a spindle of a milling machine. The 14 Q.1 drive is from an electric motor of 3.75 KW at 1440 rpm. Maximum and minimum speeds of the spindle are to be 650 & 35 rpm respectively:
 - (i) Draw structural & Speed diagram
 - (ii) Sketch the kinematic arrangement of the gear box.
 - (iii) Calculate the number of teeth on all gears.
- State advantages & disadvantages of 'Rolling contact bearings' & 'Sliding Q.2 (a) 07 contact bearings'. Discuss where each one is more suitable.
 - The following data is given for a 360° hydrodynamic bearing: **(b)** 07 Radial load: 3.5 KN Journal speed: 1550 rpm

Journal Diameter: 52 mm

Bearing length: 52 mm

Radial Clearance: 0.05 mm

Viscosity of Lubricant: 254Cp

Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing. Calculate:

- (i) The coefficient of friction
- (ii) Power lost in friction
- (iii)Minimum oil film thickness
- (iv) Temperature rise.

OR

- Select suitable rolling contact bearing for the spindle support of a machine tool 07 **(b)** having following details: Shaft Diameter: 60 mm Radial Load: 2000 N Axial Load: 400 N Average spindle speed: 800 rpm Life of bearing: 10000 Hrs.
- Discuss the various shapes of slide ways & justify their applications for machine Q.3 (a) 07 tools.
 - Discuss functions of machine tool structure & their requirements. 07 **(b)**

OR

- Discuss various types of beds used in machine tool with their constructional & Q.3 **(a)** 07 design features. 07
 - Write short note on "Antifriction Guide ways" **(b)**
- Design a crane hook for lifting capacity of 10tonnes, having triangular section. 07 **Q.4** (a) Take permissible tensile stress as 90 N/mm² for forged steel. 07
 - Discuss the role of Aesthetics in product design. **(b)**

Total Marks: 70

1

Q.4	(a)	A 6X19 wire rope of steel be used in a lift carrying maximum of 10 persons of average mass of 60 kg. An overload of 75% allows for cabin weight and inertia loads. The rope has four falls. Design the wire rope and the sheaves recommended to be used.	07
	(b)	Discuss the economic criteria that are important in evaluative product design.	07
Q.5	(a)	Name various laws of stepped regulations & discuss any one with its advantages & limitations.	07
	(b)	Write short note on "Machine Tool Chatter"	07
		OR	
Q.5	(a)	Write short note on "Feed box with Tumbler gear"	07
-	(b)	Explain deflection of spindle axis due to bending.	07
