

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VIII • EXAMINATION – SUMMER • 2015****Subject Code: 182503****Date: 13/05/2015****Subject Name: Design of Product & Machine Tools.****Time: 10.30AM-01.00PM****Total Marks: 70****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.

- Q.1** Design a gear box to give 18 speeds for a spindle of a milling machine. The 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: **14**
- (i) Draw structural & Speed diagram
  - (ii) Sketch the kinematic arrangement of the gear box.
  - (iii) Calculate the number of teeth on all gears.
- Q.2 (a)** State advantages & disadvantages of 'Rolling contact bearings' & 'Sliding contact bearings'. Discuss where each one is more suitable. **07**
- (b)** The following data is given for a 360° hydrodynamic bearing: **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**
- (b)** Select suitable rolling contact bearing for the spindle support of a machine tool having following details: **07**
- Shaft Diameter: 60 mm  
Radial Load: 2000 N  
Axial Load: 400 N  
Average spindle speed: 800 rpm  
Life of bearing: 10000 Hrs.
- Q.3 (a)** Discuss the various shapes of slide ways & justify their applications for machine tools. **07**
- (b)** Discuss functions of machine tool structure & their requirements. **07**
- OR**
- Q.3 (a)** Discuss various types of beds used in machine tool with their constructional & design features. **07**
- (b)** Write short note on " Antifriction Guide ways" **07**
- Q.4 (a)** Design a crane hook for lifting capacity of 10tonnes, having triangular section. Take permissible tensile stress as 90 N/mm<sup>2</sup> for forged steel. **07**
- (b)** Discuss the role of Aesthetics in product design. **07**

**OR**

- 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**

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