

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE – SEMESTER – VIII EXAMINATION – WINTER 2016**

**Subject Code: 182503****Date: 21/10/2016****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. Any own databook is permitted.

- Q.1** (a) Design a feed box for feed range  $s=0.1$  to  $1.11$  Mm/rev. in  $u=2$  stages. **07**  
 $o=1.41$
- (b) Explain general requirements of a machine tool design. **07**
- Q.2** (a) A ball bearing is subjected to radial load of  $10$  KN and thrust load of  $4$  KN. **07**  
The inner ring rotates at  $1000$  rpm. The average life is  $5000$  hrs. What basic load rating must be used to select a bearing for this purpose.
- (b) Compare Hydrodynamic and Antifriction bearings in view of various parameters. **07**
- OR**
- (b) Explain how the lubricant is selected? **07**
- Q.3** (a) Deep groove ball bearing SKF 6207 carries a combined load of  $1820$  N radially and  $1365$  N axially at  $1200$  rpm. The outer ring rotates and the bearing is subjected to moderate shock. Find the average expected life of this bearing in hours. **07**
- (b) A block and tackle consists of three sheave fixed block and three sheave movable block. Take pulley  $c$  is  $1.05$  resistance factors. Determine load that can be lifted when pull in rope is  $750$  N. Determine also size of rope taking permissible tension in rope  $=2.8d^2$ . Where  $d$  = dia of rope in mm. Find factor of safety. **07**
- OR**
- Q.3** (a) Design a crane hook for a  $60$  KN capacity. The hook is forged from steel **07**  
having a safe normal stress of  $130$  N/mm<sup>2</sup>.
- (b) Discuss design criteria for Machine Tools structures. **07**
- Q.4** (a) Discuss various types of Beds used in machine tools, their construction and design features. **07**
- (b) Discuss Economic considerations with reference to Product Design. **07**

**OR**

- Q.4** Following data is given for a Full hydrodynamic bearing:  
 Journal diameter: 100 mm  
 (ii) Bearing length: 100 mm  
 Radial load: 75KN  
 (iv) Journal speed: 1440 rpm  
 (v) Radial Clearance: 0.15mm  
 (vi) Viscosity of lubricant: 16 cp  
 Calculate: (i) Minimum film thickness, (ii) Co-efficient of friction and (iii) Power loss in friction.

- (b) Discuss functions and requirements of spindle unit. **07**

- Q-5 (a)** Select suitable rolling contact bearing for the spindle support of a machine tool having following data: **07**  
 (i) Shaft diameter: 60 mm  
 (ii) Radial Load: 2000 N  
 (ii) Axial Load: 400N  
 (iv) Average spindle speed: 800 rpm  
 (v) Life of bearing: 10000 hrs.

- (b) Discuss the role of Aesthetics in product design. **07**

**OR**

- Q-5 (a)** Explain geometric harmonic and logarithmic progression. Find speed steps for Following conditions.  $N_{min}=12$  rpm.  $N_{max}=510$  rpm  $z=8$ . For all progressions. **07**

- (b) Write short note on “Feed box with Tumbler gear” **07**

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