**Seat No.: _____** **Enrolment No._____**

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–VIII (NEW) - EXAMINATION – SUMMER 2017**

**Subject Code: 2182503** **Date: 04/05/2017**

**Subject Name: Design of Product and Machine Tools**

**Time: 10:30 AM to 01:00 PM** **Total Marks: 70**

**Instructions:**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **PSG Design data book permitted.**

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|---|---|---|---|
| **Q.1** | **(a)** | Design the feed box of a lathe machine for the feed range 0.1 – 1.11 mm/rev. Given Ø = 1.41 and u = 2. Assume a suitable kinematic train between the spindle and the input shaft of the feed box, and between the output shaft of the feed box and the rack, attached to the underside of the lathe bed. | **14** |
| **Q.2** | **(a)** | Discuss general requirements of machine tool design. | **07** |
| | **(b)** | Explain effect of machine tool compliance on machining accuracy. | **07** |
| | | OR | |
| | **(b)** | Write a note on hydraulic step less regulation of speed and feed rates. | **07** |
| **Q.3** | **(a)** | Discuss economic criteria that are important in evaluative product design. | **07** |
| | **(b)** | Write a note on Antifriction guide ways. | **07** |
| | | OR | |
| **Q.3** | **(a)** | Give properties of sliding contact bearing material. | **04** |
| | **(b)** | Design a hydrodynamic bearing for a shaft of centrifugal blower from following data: (1) blower speed = 600 rpm, (2) shaft diameter = 50 mm, (3) bearing load due to belt force = 3000 N, (4) bearing load due to weight of rotor = 600 N, (5) expected temperature of oil = 70 °C, (6) Ambient temperature = 30 °C, (7) c/d ratio = 0.0015, (8) minimum film thickness = 0.019 mm. Calculate Actual attitude, Types of oil used, Power loss, Heat generated, and Actual minimum film thickness. | **10** |
| **Q.4** | **(a)** | Explain types of radial ball bearings. | **04** |
| | **(b)** | Select a single row deep groove ball bearing for a radial load of 4000 N and an axial load of 5000 N, operating at a speed of 1600 rpm for rating life of 5 years at 10 hours per day. Assume 300 working days per year and bearing subjected uniform and steady load. | **10** |
| | | OR | |
| **Q.4** | **(a)** | Explain methods of adjusting clearance in slide ways. | **07** |
| | **(b)** | Prove that the loss of economic cutting speed is constant over the whole range of spindle speed in GP series. | **07** |
| **Q.5** | **(a)** | Design a steel wire rope for a mine hoist for lifting 1500 kg in a single run. The hoist trolley weight 200 kg. The rope has two falls. The maximum acceleration imparted to the hoist while lifting is 3 m/sec2. Select 6 x 19 rope having ultimate breaking strength of 1400 N/ mm2 and Er = 9.8 x 104 N/mm2. Considered total no of bends = 6. | **07** |
| | **(b)** | Explain various stages of product development process. | **07** |
| | | OR | |
| **Q.5** | **(a)** | Design a crane hook for lifting capacity of 6 tonnes. It is made of forged steel and has approximate triangular section. Take permissible tensile stress 120 N/mm2 for forged steel. | **07** |
| | **(b)** | Discuss step by step design procedure of hydrodynamic bearing. | **07** |

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