

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – I • EXAMINATION – WINTER 2012****Subject code: 712805N****Date: 12-01-2013****Subject Name: Design of Machine Tools****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) List and explain the basic requirements of machine tool design. **07**
(b) Write short note on: Hydraulic transmission and its elements. **07**

- Q.2** (a) State the main requirements of machine tool structures. Explain the strength and stiffness as design criteria related to machine tool structures. **07**
(b) Explain the design criteria to be considered for machine bed design. **07**

OR

- (b) Explain the model techniques in design of machine tool structures. **07**

- Q.3** (a) Explain the different protecting devices used for guideways / slideways in detail with neat sketches. **07**
(b) Explain the design considerations to be considered while designing sliding friction power screws. **07**

OR

- Q.3** (a) Explain the strength and stiffness based design of slideways. **07**
(b) Explain the recirculating ball type lead screw with neat sketches. **07**

- Q.4** (a) The following data refers to a radial drilling machine gearbox: **09**
Electric motor – 10 kW, 1440 r.p.m.
Minimum speed -70 r.p.m. Maximum speed – 1800 r.p.m.
No. of speed steps – 8
Speed reduction from motor shaft to input gearbox shaft = 1.6 : 1
Draw the structural diagram, speed chart and layout diagram of gearbox.
Find number of teeth also.

- (b) Write short note on: Spindle materials and its selection. **05**

OR

- Q.4** (a) Fig 1 shows a schematic diagram of a lathe spindle and the other data are as under: **09**
Power – 4.5 kW Speed -700 r.p.m.
Ratio of outer to inner diameter (hollow spindle) = 2
Peripheral and radial forces acting on spindle: $P_2 = 215 \text{ kgf}$ and $T_2 = 78 \text{ kgf}$
Horizontal and vertical forces acting on spindle nose: $P_1 = 210 \text{ kgf}$ and $T_1 = 60 \text{ kgf}$
Compliance = 0.52 Micron/kgf
Maximum permissible deflection = 0.017 mm
Calculate the main dimensions of lathe spindle.

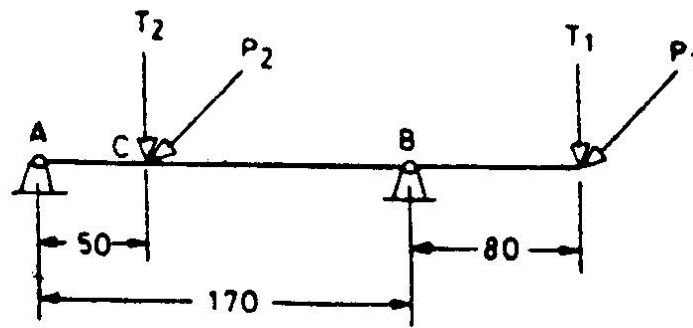


Fig 1 Diagram of lathe spindle

All dimensions are in mm

- (b) Explain the structural diagram and their analysis to select the best possible version of gearbox. 05
- Q.5 (a) Compare the flat-flat and v-flat type slideways with neat sketch. 07
- (b) Explain the general procedure for accessing dynamic stability of EES. 07
- OR**
- Q.5 (a) Explain the different methods used to improve the rigidity of machine tool columns with neat sketches. 07
- (b) Write short note on: Machine tool testing (acceptance tests) – needs, standards and procedure of testing. 07
