

GANPAT UNIVERSITY
B.TECH SEM VIII MECHATRONICS ENGINEERING
REGULAR EXAMINATION MAY-JUNE 2012
MACHINE TOOL DESIGN -803

TOTAL MARKS: 70

TIME: 3 HOURS

INSTRUCTIONS: 1. All questions are compulsory
2. Assume suitable data if necessary.

- Q.1. (6)
(A) Explain design procedure of speed gear box. (6)
- (B) Draw the structural diagrams of a machine tool speed box for $N_{min} = 16$ rpm,
 $N_{max} = 770$ rpm and $\phi = 1.26$. Which layout is best and why?
OR (5)
- Q.1. (7)
(A) Why geometric progression series is preferred over arithmetic progression series?
Discuss their merits and demerits. (7)
- (B) A 2 X 2 drive is required to be designed for transmitting 7.5 kW with speed ranging
from 400 rpm with $\phi = 1.41$. Select suitable structural form and optimum ray
diagram. (6)
- Q.2. (5)
(A) Why machine tool structures are designed considering rigidity criteria not with the
strength criteria? (5)
- (B) What is structure diagram? How best structure diagram is selected?
OR (6)
- Q.2. (5)
(A) Explain design procedure of feed gear box. (5)
- (B) Choice of hydraulic depends on which factors? Explain selection of electrical motor. (12)
- Q.3. Attempt any three
(A) Explain general requirement of machine tool.
(B) Explain in brief Vibration Isolation for machine tool.
(C) Explain machine tool design consideration for two criteria (a) Manufacturing (b)
Economy.
(D) Explain Step less regulation of speed and feed rates in machine tool. (2)
- Q.4. (6)
(A) Explain function of machine tool structure and also discuss about their requirement
during design. (6)
- (B) During turning operation a 200 mm diameter job in a lathe machine the following
cutting forces act as shown calculate cutting forces act as (1) the force disposition at
the head stock and tail stock centers (2) The maximum torque on the lathe bed.
Neglect the weight of work piece.

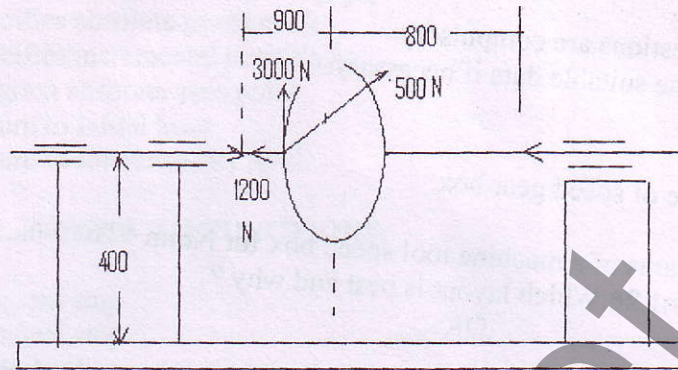


fig 4 B all dimensions are in mm

(C) Explain basic design procedure for column of a drilling machine. (4)

OR

Q.4. (3)

(A) Compare various section of bed and discuss how their rigidity of bed section is increased? (6)

(B) Design a spindle for a given figure.

Spindle have maximum power consumption 7 kW, RPM = 1000

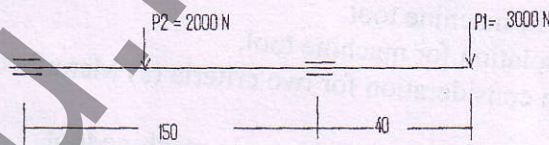


fig 4 B

(C) Explain design procedure for column in machine tool. (3)

Q.5. (3)

(A) Explain about recirculating ball screws (5)

(B) A Lathe has two flat cast iron sideways of equal width and height half the width. While turning a 100 mm diameter work piece the tangential radial and axial components of cutting forces were found to be $P_z = 5000\text{N}$, $P_y = 1500\text{N}$ and $P_x = 1000\text{N}$. The lathe carriage weighs 1400 N and is 40 cm long. Calculate the sideways width assuming suitable value for h , b , Y_q , Z_q and X_p . cast iron sideways can withstand a maximum pressure of 250 N/mm^2 (3)

(C) Explain about design of hydrodynamic sideways
OR

Q.5.

(A) Explain about plastic guide ways. (3)

(B) Explain about forces acting on the mating surfaces in a combination of two flat sideways and derive a equation of pulling force. (5)

(C) Determine the width and length of straight flat hydrodynamic sideways to support a load of 7000N at a sliding speed of 2 m/min. The lubricant has a kinematics viscosity of 20cs at 50° centigrade. And density of 0.8 gram/cm^3 . Assume that maximum permissible pressure is 20 N/cm^2 . and minimum film thickness = 0.02 mm. If the load is supported by six composite slider bearing of same width, determine the length of each slider.

Q.6.

Attempt any three. (12)

(A) Explain function and requirement for a spindle and also explain about its material.

(B) Explain about aerostatic guide ways.

(C) Explain about hydraulic circuit for shaping machine and grinding machine.

(D) Explain sources of vibration in machine tool and its effect on tool life.

END OF PAPER