Printed Pages : 2 **Roll No.** | | | | | | | | | | | **NPI601**

B. TECH.

THEORY EXAMINATION (SEM–VI) 2016-17

PRINCIPLE OF MACHINE TOOL DESIGN

Time : 3 Hours ***Max. Marks : 100***

Note : *Be precise in your answer. In case of numerical problem assume data wherever not provided.*

SECTION-A

1 **Attempt all the questions:** **(10×2=20)**

a) Define tool wear.

b) What is law of gearing?

c) Define Androin progression ratio.

d) What do understand by 'chatter' in machine tool?

e) What materials are commonly used in machine tool spindles?

f) What is a transfer machine?

g) Differentiate between shaper and planer.

h) What do you understand by the term' control system'.

i) What is selection range ratio?

j) What are the factors affecting the stiffness of machine tool structures?

SECTION-B

2 **Attempt any five of the following:** **(10×5=50)**

a) Design a journal bearing for a centrifugal pump for the following conditions

Journal diameter = 75 mm

Speed of the journal = 1140 rpm

Load on the journal = 11500 N

b) Show that in orthogonal cutting with zero rake tool, the ratio of shear stress(τ) to the specific cutting energy $(P_{s)}$ is given by

$$\frac{\tau_s}{P_s} = \frac{(1-\mu r_c)r_c}{1+{r_c}^2}$$

r_c= chip thickness ratio

μ= coefficient of friction between the tool and chip

c) With the help of a neat sketch describe the working of a cam- controlled mechanism in automatic lathes.

d) 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 an average life of 5 years at 10 hrs. per day. Assume uniform and safety load?

e) Explain any three mechanisms that are used for converting rotary motion in to rotary motion of an operative element. What is the principle of screw and nut transmission?

f) Explain design features and types of machine tool beds with neat sketches?

g) With the help of a neat sketch explain the working principle of Ward-Leonard drive used for machine tools. What are some of the important applications of this type of drive?

h) Design the headstock of a lathe having nine spindle speeds ranging from 50 rpm. The machine capacity is 6 KW, with common ratio as 1.5. Show the layout of gearbox and connection to the motor?

SECTION-C

Attempt any two of the following: **(15×2=30)**

3. A pair of helical gears 23º helix angle is used to transmit 25 KW at 3000 rpm from the pinion shaft with a velocity ratio of 3:1.The static strength of the gear material can be taken as 75 MPa. Number of teeth on the pinion is 24. Find the module pitch, face width and axial thrust developed on the shaft for 20º full depth involute teeth and also check the design against static strength considerations?

4. Explain the hydraulic transmission system that is used for rotary motion with neat sketch. Why it is known as step less transmission system?

5. What is meant by Dynamic rigidity in case of machine tool design? Explain what parameters influence the vibration behavior of machine tool? How to achieve a high value of dynamic rigidity?