QUESTION 1
a) Explain the Design phases
b) Define machine design process

## QUESTION 2

A cone clutch has an angle of $12.5^{\circ}$ and a mean diameter of 508 mm . If the clutch is to trasmit15 hp at1000rpm and the coefficient of friction is 0.25 . what axial spring force is required. Calculate on the basis of uniform wear.

## QUESTION 3

A pulley of 150 mm diameter running at 1600 rpm drives a follower of 800 mm diameter the two shafts being 1.2 m apart. And the free part of the belt is considered straight. The belt has mass of $0.5 \mathrm{~kg} / \mathrm{m}, \mathrm{Tm}=800 \mathrm{~N}$ and friction $=0.5$;

## Estimate:

i. Tension in slack sided
ii. The speed of the driven pulley
iii. The power transmitted

## QUESTION 4

The pinion 2 runs at 1800 rpm and transmits 3 Kw to the idler gear 3 . The teeth are cut on the $20^{\circ}$ full depth system and has module of $m=3$. Draw a free body diagram of gear 3 and show all the forces which act upon it.


## QUESTION 5

A gear set consists of a 16tooth pinion driving a 40tooth gear. The module ie is 12 mm and the addendum and dedendum are 12 and 15 mm respectively. The gears are cut using a pressure angle of $20^{\circ}$
Compute:
i. The circular pitch
ii. The center distance
iii. thew radii of circles

## QUESTION 6

A block brake has a configuration as shown in the diagram below. The drum is 300 mm in diameter rotates at 100 rpm , and transmits 5horse power. Assume that $\mathrm{a}=150 \mathrm{~mm}, \mathrm{~b}=300 \mathrm{~mm}$ and $\mathrm{c}=100 \mathrm{~mm}$ and that the coefficient of friction is 0.3 . Find the operating force needed to stop the drum if;
i. Clockwise rotation is assumed
ii. Counterclockwise rotation is assumed.


