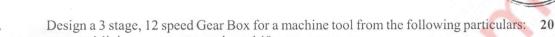
(3 Hours)

Total Marks: 80

NB: (1) Question No. 1 is compulsory.

- (2) Attempt any THREE questions from the remaining.
- (3) Use of PSG Design Data Book is permitted.
- (4) Make appropriate assumptions, wherever necessary.
- (5) Illustrate your answers with **neat** sketches.

Motor speed



= 1400 rpm.

Minimum output speed = 140 rpm Maximum output speed = 1100 rpm Input motor power = 8 kW

Design the shaft sizes, arrangement of gears and their sizes. Also draw the structural diagram, optimum ray diagram and deviation diagram. Prepare a neat sketch depicting the layout of the gear box with relevant details.

- (a) Discuss the step to step procedure for designing a V-belt drive.
 (b) Design a lead screw and nut for a lathe to sustain an axial load of 12 kN. The lead screw is to be 2.6 m long and is to rotate at 65 rpm. The coefficient of friction at the collar and threads could be taken as 0.12 and 0.14 respectively.
- (a) Discuss the various materials used for clutch design.
 (b) Design and sketch a multi-plate clutch used in a metal cutting machine tool with a power transmitting capacity of 12kW at 1000 rpm. The clutch is to be operated 100 times in an 8 hour shift. The design should include the discs and the operating lever. Assume appropriate data from hand book, clearly specifying the same.
- 4. (a) Discuss with sketches various acceptance tests carried out on a lathe.

 (b) Design a journal bearing to be used on a shaft which is meant to transmit 6 HP at 900 rpm. Radial load on journal is 8kN, direct angle on the bearing is 180°. The bearing surface temperature is to be maintained at 60° C.
- 5. (a) Discuss the wear compensation techniques used in slideways.

 (b) A deep groove ball bearing with dynamic capacity of 30kN is loaded as shown:

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Axial Load (N)	Radial Load (N)	rpm	%cycle time
3000	3000	1200	25
2000	2500	1100	35
4000	2000	1000	40

Determine: Cubic mean load, 90% life of bearing in hours, Average life of bearing in hours.

- 6. Write explanatory notes on any **four** of the following:-
 - (a) Anti-friction guideways.
 - (b) Types of belts and materials of construction.
 - (c) Norton gear box.
 - (d) Bed and column sections used in machine tools.
 - (e) Machine tool safety requirements.

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