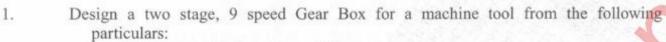
Q. P. Code: 18537

(3 Hours)

Total Marks: 80

NB: (1) Question No. 1 is compulse	ory	V	V
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- (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.



Minimum output speed = 200 rpm

Maximum output speed = 1000 rpm

Input motor power

= 10 kW

Motor speed

= 1440 rpm.

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 flat belt pulley.

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- (b) Design a lead screw and nut for a lathe to sustain an axial load of 10 kN. The lead screw is to be 2 m long and is to rotate at 50 rpm. The coefficient of friction at the collar and threads could be taken as 0.12 and 0.14 respectively.
- (a) Discuss the various safety devices incorporated in machine tools.

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- (b) Design and sketch a multi-plate clutch used in a metal cutting machine tool with a power transmitting capacity of 8kW at 800 rpm. The clutch is to be operated 80 to 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.
- (a) Discuss with sketches various acceptance tests carried out on a lathe.

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- (b) Design a journal bearing to be used on a shaft which is meant to transmit 7HP at 950 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 various slideway profiles with applications..

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(b) A deep groove ball bearing has dynamic capacity of 40 kN. It is subjected to the following duty, during one cycle of operation.

- 1. Radial load of 3000N at 400 rpm for 25% of time
- Radial load of 6000N at 600 rpm for 40% of time
- 3. Radial load of 1000N at 600 rpm for rest of the time
- 4. Constant axial load of 3000N.

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

Write explanatory notes on any four of the following:-

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- (a) Wear compensation techniques in a slideway.
- (b) Types of belts and materials of construction.
- (c) PIV drives.
- (d) Bed and column sections used in machine tools.
- (e) Machine tool structure requirements and design guidelines.
