

[Time: **THREE Hours**]

[Max. Marks: **80**]

“Please check whether you have got the right question paper.”

N.B

- 1) Attempt any three questions from each section.
- 2) Assume suitable data if necessary.
- 3) Use of non programmable calculator is allowed

SECTION A

Q.1 Two parallel shafts are connected by using a pair of steel helical gears. A pinion mounted on one shaft transmits 18 kw power at 3500 rpm. The safe static strength of the material is 120 mpa. The gear ratio is 4:1, the stab teeth with 20^0 pressure angle in diametric plane is having helix angle of 20^0 . Design the gear drive completely and check the design for dynamic load. Consider the number of teeth on pinion to be 30. 14

Q.2 It is required to design spur gear drive containing pair of spur gears having 20^0 involutes full depth 14 teeth for transmitting 16 kw. The pinion rotates at 275 rpm and the velocity ratio is 1:3. The allowable static stresses for gear and pinion materials are 120 & 140 mpa. respectively .consider the number of teeth on pinion as 18.

Q.3 A multiple disk neat clutch consists of steel and bronze plates transmitting 14 kw at 1400 rpm. The 13 inner and outer diameter of disk being 120 mm and 180 mm respectively. The engagement factor is 1.2. The coefficient of friction between contracting plates is 0.14 and maximum intensity of pressure is 0.25 mpa. Using uniform wear and uniform pressure conditions, find out the required number of steel and bronze plates.

Q.4 Write short notes:- 13

A Various means for controlling the engagement of clutch.

B Forms of teeth's in spur gears.

C Advantages and disadvantages of worm and warm gears.

SECTION B

Q.5 A deep groove ball bearing has a dynamic capacity of 21000 N and it operates on the following work cycle of different radial loads- 7000 N at 275 rpm for 25% of time, 8000 N at 400 rpm for 20% of time, 4000 N at 500 rpm for remaining time, assume that the loads are steady and the inner race rotates. Find the average life of bearing in hours. 14

Q.6 A flat belt drive is used to transmit 15 kw power from a pulley rotating at 800 rpm to another pulley rotating at 300 rpm. The center distance between the pulleys is twice the diameter of larger pulley. The belt is operating at constant speed of 22 m/sec. The maximum stress in the belt should not exceed $4 N/mm.^2$ if the density of leather belt is 0.98 gm/cc and coefficient of friction between belt pulley is 0.35 & belt thickness is 5 mm, calculate :- 14

- 1) Diameter of pulley
- 2) Length & width of the belt
- 3) Belt tensions.

- Q.7 In a band and block brake, the band is lined with 16 blocks, each subtending an angle of 15° at the center. Find out the least force required for the brake to absorb 220 kw at 300 rpm. Take $\mu = 0.30$ lengths of pins on either side of fulcrum equal to 150 mm and 30 mm respectively and length of lever as 0.5m. consider brake drum diameter as 800 mm and thickness of each block as 60 mm. 13
- Q.8 Write short notes on :- 13
- A Heat dissipation in brakes
 - B Compare rolling contact bearing and sliding contact bearings.
 - C Important factors to be considered in brake design.