

Total No. of Printed Pages:03

SUBJECT CODE NO:- H-564
FACULTY OF SCIENCE AND TECHNOLOGY
T.E. (Mechanical) (CGPA) (Sem-II)
Design Of Machine Elements – II
[REV]

[Time: Three Hours]

[Max. Marks: 80]

Please check whether you have got the right question paper.

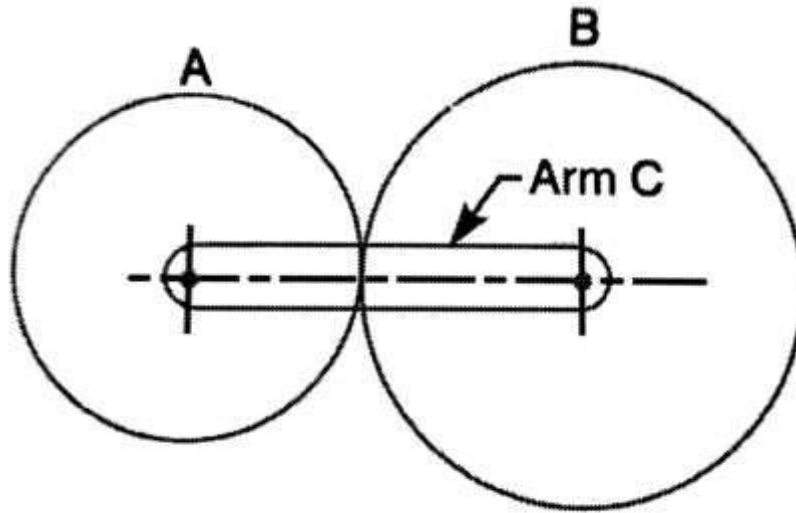
N.B

- i) Q. No. 1 and Q. No. 6 are compulsory.
- ii) Solve any two questions from remaining in each section.
- iii) Assume suitable data if necessary.
- iv) Design data book is allowed.

SECTION - A

- Q.1 Solve any five 10
- I) What are the types of gear failure?
 - II) How gears are classified?
 - III) Enlist various types of gear trains?
 - IV) Define formative number of teeth in helical gears.
 - V) Write down the Torque equation of single plate clutch for uniform wear and uniform pressure theory.
 - VI) What are the various forces acting on worm and worm gears?
 - VII) Write a note on efficiency of worm gear.
- Q.2 A pair of spur gear with 20° full depth involute teeth is used to transmit 25 kW at 900 rpm of the pinion. The gear ratio is 6.25:1, the material for pinion is plain cast steel with permissible static stress of 103 MPa and for gear cast iron with permissible static stress of 55 MPa wear load factor 1.3 N/mm^2 and dynamic load factor for carefully cut gear with 0.036 mm error $C=282 \text{ kN/m}$. Determine module, face width from the stand point of beam strength, dynamic load and wear. Use minimum number of teeth on pinion as 18. Assume $K_v = \frac{3}{3+v}$ and $y=[0.154-(0.912/(\text{No. of teeth}))]$. 15
- Q.3 A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 100 teeth gear. The pinion rotates at 720 rpm. The normal pressure angle is 20° , while the helix angle is 25° . The face width is 60mm and the normal module is 4 mm. the pinion as well as the gear is made of steel 40C8 (Sut = 600 N/mm²) and heat treated to a surface hardness of 300 BHN. The service factor and the factor of safety are 1.5 and 2 respectively. Assume that the velocity factor accounts for the dynamic load and calculate the power transmitting capacity of gears. 15
- Q.4 In an epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 rpm in the anticlockwise direction about the centre of the gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed makes 300 rpm in the 15

clockwise direction, what will be the speed of gear B?

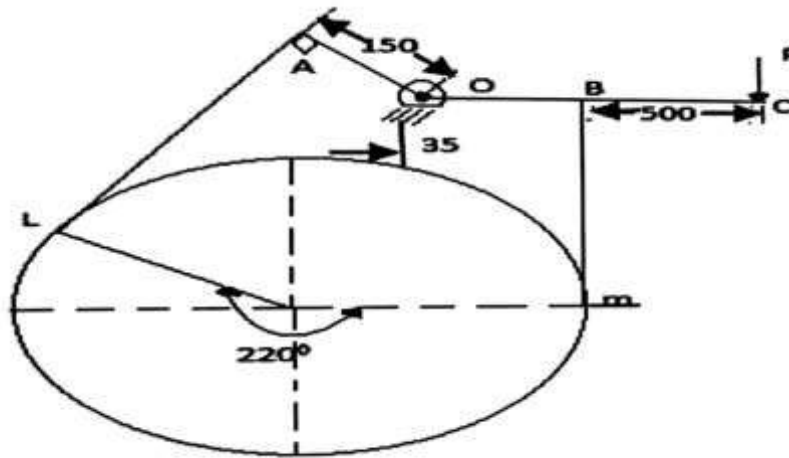


- Q.5
- A) What are the advantages of single plate clutch over multiplate clutch? Why multiplate clutch is preferred in two wheeler bikes. 05
 - B) A multiple disc clutch consisting of steel and bronze plates is to transmit 5 KW at 800 rpm. The inner and outer diameter of disc are 60 mm and 130 mm respectively. The engagement factor may be taken as 1.5, $\mu = 0.2$ intensity of pressure is limited to 0.3N/mm^2 . Determine the required number of steel and bronze plates. Assume uniform wear theory. 10

SECTION – B

- Q.6 Solve any five 10
- I) Classify Brakes? State one application of each type of brake
 - II) Important factors to be considered in brake design.
 - III) What are the various belt materials and criteria for its selection?
 - IV) Compare between V-belt drive and flat belt drive.
 - V) Compare sliding contact bearing and rolling contact bearing.
 - VI) Define hydrodynamic bearing.
 - VII) Justify centrifugal tension has no effect on power transmitted.
- Q.7 A flat belt is required to transmit 30 kW from a pulley of 1.5m effective diameter running at 300 r.p.m. The angle of contact is spread over $11/24$ of the circumference. The coefficient of friction between the belt and pulley surface is 0.3. Determine, taking centrifugal tension into account, width of the belt required. It is given that the belt thickness is 8 mm, density of its material is 1100 kg/m^3 and the related permissible working stress is 2.5 MPa. 15
- Q.8 A differential band brake as shown in fig has an angle of contact of 220° . The band has a compressed woven lining and bears against a cast iron drum of 350 mm diameter. This is sustains a torque of 350Nm and the coefficient of friction between the band and the drum is 0.3. Find. 15
- a) The necessary force (P) for the clockwise and anticlockwise rotation of the drum.

b) The value of “OA” for the brake to be self-locking when the drum rotates clockwise.



- Q.9 A 100 mm diameter shaft operating at 2000 rpm is supported in a 140 mm long full journal bearing subjected to a radial load of 43KN. Operating temperature of oil is limited to 80°C and surrounding air temperature is 40°C. Assume $ZN/p = 30 \times 10^{-6}$. Using McKee and Lasche equation, determine coefficient of friction, bearing pressure H_g and H_d and viscosity Z of the lubricant. Assume Practical value of $r/c = 100$ 15
- Q.10 A) State the desirable properties of good lubricating oil. 05
 B) A deep groove ball bearing has a dynamic capacity of 20500 N and it operates on the following work cycle of different radial loads :- 10
 6000N at 250 rpm for 20% of time.
 9000N at 500 rpm for 25% of time.
 3600N at 400 rpm for remaining time.
 Assume that the loads are steady and the inner race rotates, find the average life of bearing in hours.