

[ 3 Hours ]

[ Total Marks : 80 ]

- N.B.** 1) **Question No. 1 is compulsory**  
2) Solve **Any Three** from remaining **Five** questions.  
3) Use of standard data book is permitted  
4) Assume suitable data if necessary, giving justification



- Q1 Answer any **Four** from the following
- a) Prove theoretically, in gear design tangential force transmitted is directly Proportional to beam strength? **5**
  - b) Enumerate the factors that influence most the formation and maintenance of the thick oil film in hydrodynamic bearings **5**
  - c) State the characteristics of the chain drive and discuss the polygon effect. **5**
  - d) How much reduction in loading of a roller bearing will cause the expected life to be fifty percent more? **5**
  - e) Justify the significance of Pressure angle in gear tooth design. **5**
- Q2 A rotary disc cam and central translator follower has following motion:- **20**  
Forward stroke = 25 mm in  $100^\circ$  rotation of cam with SHM, dwell to complete the cycle.  
Return stroke = 25 mm with SHM in  $90^\circ$  of cam rotation remaining dwell to complete.  
Mass of follower is 1 Kg and cam shaft rotates at 850 rpm and maximum pressure angle is  $25^\circ$  during forward stroke. The external force is 200 N during forward stroke and 50 N during return stroke.  
Determine
- 1. Base circle radius
  - 2. Design the cam
  - 3. Design the spring
  - 4. Calculate maximum cam shaft torque.
- Q3 A V- Belt drive is to transmit 15 KW to a compressor. The motor speed is 1200 rpm and compressor pulley runs at 550 rpm. The coefficient of friction between the belt and pulley is 0.25. The compressor operates for 12 hrs/ day. Design the drive for above application. Design should include following **20**
- 1. Section of V-Belt material
  - 2. Exact centre distance
  - 3. Belt size
  - 4. Number of belts
  - 5. Life of belt.

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- Q4 Design a helical gear pair for the first stage of gear box having following 20 specifications.  
Power = 20 kW  
Input speed = 1440 rpm  
Output speed = 90 rpm  
(Design should include, module selection, checking for dynamic Load and contact stresses and construction type and constructional details of gear)
- Q5 A worm and worm wheel pair is to be design for a following specifications,  
Power = 15KW, Worm speed = 960RPM, Velocity ratio = 28.
- i) Find the number of start and number of teeth on the gear. 4
  - ii) Select suitable material and find the axial module of the worm based on wear criteria. 6
  - iii) Check design for bending and dynamic load 5
  - iv) Check the design for thermal conditions. 5
- Q6 a) Select suitable Deep groove ball bearing for following specification: 10  
Shaft diameter = 40mm, Radial load = 850N, Axial load = 700N, Speed = 760rpm, Expected life = 5000hrs, Reliability = 92%
- Q6 b) Design a chain based on bearing failure and check for tensile failure for the following 10 specification.
- Rated power : 22 KW
  - Input speed : 1200 rpm
  - Output speed : 250 rpm
  - Nature of load and duty: mild shock and 8 - 10 hrs
- ( Design should include, Number of teeth on sprockets, centre distance, pitch, number of link and chain length)