

(3 Hours)

Marks: 80

- Question No. 1 is compulsory.
- Attempt any three questions from the remaining.
- Assumption made should be clearly stated.
- Use of standard Design Data Book by PSG, Mahadevan is permitted.

- Q.1 **Answer any four**
- Write the Assumption made by Lewis and derive Lewis beam strength equation. 5
 - Write the difference between Hydrostatic Bearing and Hydrodynamic Bearing. 5
 - Write Classification of clutch and according to uniform wear theory, prove that for maximum torque capacity of plate clutch, $R_i = 0.577 R_o$. 5
 - What is pressure angle in cam, explain the significance of pressure angle in cam and follower design. 5
 - With neat sketch explain force analysis of Bevel gear. 5
- Q.2 A single stage helical gear box is used to transmit 12.5 KW power at 1440 rpm of pinion. The desire transmission ratio is 5:1
Assume 20 degree FD involute profile and material C50 for pinion and gear.
- Find the module
 - Check gear for Lewis dynamic load
 - Check gear for contact stresses.
 - Write constructional details.
- Q.3 (a) Design a Worm and worm wheel drive to run a reciprocating feeder at 40 rpm from the motor which run at 1440 rpm and delivers power of 15KW. Also check for thermal criteria. 15
- (b) What are the materials commonly used for mechanical seals. Explain Stationary and Rotating Mechanical Seal with application. 5
- Q.4 (a) A full journal bearing has a following specification, 10
- Application: Centrifugal Pump
Load to be supported: 10KN
Speed: 960 RPM
Oil used : SAE 20
Diametral Clearance Ratio, D/C : 1000
Find, 1) Dimensions of the bearing, 2) Co-efficient of friction, 3) Minimum Film Thickness, 4) Temperature rise of oil 5) Heat generated and Heat Dissipated.

- (b) Select suitable DGBB for the shaft diameter of 60mm and reliability of 98 percentage, which rotates at 1440rpm with radial load of 2500N and Axial load of 1200N, Expected life of the bearing is 25000 hrs and load factor is 1.2. 10
- Q.5 (a) Design a chain based on bearing failure and check for tensile failure for the following specification. (Design should include, Number of teeth on sprockets, centre distance, pitch, number of link and chain length) 10
 Specification:
 I. Rated power : 4 KW
 II. Input speed : 90 rpm
 III. Output speed :20 rpm
 IV. Nature of load and duty: mild shock and 8 - 10 hrs.
- (b) Find the flat belt dimensions and life in hours for the following specification, 10
 Power = 10 KW, Input Speed =1440 rpm, Output Speed = 480rpm, Centre Distance = 3 m.
- Q.6 (a) A multiplate clutch is used to transmit 10KW power at 1440 rpm. The inner and outer diameter of contacting surfaces are 60mm and 100mm respectively. Coefficient of friction is 0.15 and permissible intensity of pressure is 0.25MPa. Determine 1) The number of pressure plate and friction plate, 2) The axial force required to transmit power, 3) The actual average pressure, 4) The actual maximum pressure intensity after wear. 10
- (b) A Rotary disc cam with central translatory roller follower has following motion. 10
 Forward Stroke of 25mm in 120° of cam rotation with SHM motion, dwell of 60° of cam rotation and return stroke of 25mm in 100° of cam rotation with SHM. Remaining dwell to complete the cycle. Mass of the follower is 1Kg and cam shaft speed is 600 rpm .The maximum pressure angle during forward stroke and return stroke is limited to 25° . The external force during forward stroke is 300 N and that of return stroke is 50N.
 I. Draw displacement , Velocity and Acceleration time diagram
 II. Find Prime circle radius, Base circle radius
 III. Calculate radius of curvature of pitch curve and cam profile
 IV. Determine the face width of the cam based on contact stress.
