**Design of Machine Elements II**

Section A

1. Give the applications of 6x19 wire rope.
2. Explain the cross-section of a V-belt with suitable sketch.
3. Differentiate between Slip & Creep.
4. What do you mean by polygonal effect in chain drive?
5. What is backlash in gear tooth?
6. What is the condition for self-locking block brake?
7. Mention at least four major advantages of V-belt drive over flat-belt drive
8. Explain the meaning and significance of' spring index'.
9. What are the criteria for the selection of weaker between pinion and gear while designing
10. a gear drive?
11. Differentiate between herringbone and double helical gear.
12. What is the use of flywheel in punching press?
13. Write and explain the load-life relation for a roller bearing.
14. What is polygonal effect in a chain drive?
15. List the bearing performance parameters.
16. Distinguish between ‘Hydro-dynamic bearings’ and ‘Hydro-static bearings’.
17. Define ‘Bearing Modulus’.
18. What is the effect of pre-loading of tension springs?
19. List the advantages and disadvantages of Worm Gear drives.
20. What is the effect of centre distance and pulley size, on the life of a belt?
21. ‘Chain drive has some features of belt drive, and some of the gear drive’. Explain.
22. Describe a band brake.
23. What is a positive clutch?
24. What is a function of a flywheel?
25. Discuss about the various types of stresses induced in a flywheel rim.

Section B

1. A multi-disc clutch has three discs on the driving shaft and two on the driven shaft. The clutch is reqired to transmit 30 kW at 1700 r.p.m. The contact surfaces. are in dry condition and the coefficient of friction is 0.1. The inside diameter of the contact surface is 7.5 cm. If the Permissible pressure on friction lining is limited to 0.5 MPa, determine the outside diameter of the clutch plate based on uniform wear theory. What is the force required to engage the clutch.
2. In an application, a 360° hydrodynamic bearing having journal diameter of I 00 mm and lid ratio of I was used to support a radial load of 50000 N, acting on the shaft running at 1440 r.p.m. A lubricant with a viscosity maintained at 20 cP was used to avoid direct contact of journal and bearing surface which maintained radial clearance of 0.12 nun. Calculate the magnitude of (i) minimum film thickness, (ii) coefficient offriction and (iii) power lost in friction.
3. Prove that the bending stresses induced in the full-length leaves of leaf spring are 50% more than those in the graduated leaves.
4. Design an open belt drive to transmit 100 kW for a system consisting of two pulleys of diameters 0.9 m and 1.2 m, centre distance of 3.5 m, a belt speed 19 m/s, coefficient of friction 0.3, a slip .of 1.2% at each pulley, 5% friction loss at each shaft. The drive is to be designed for 20% over load.
5. A simple band brake operates on a drum of 0.5 m in diameter that is running at 300 r.p.m. The coefficient of friction is 0.3. The brake band has a contact of 270°, one end is fastened to a fixed pin and the other end to the brake arm, 0.1 m from the fixed pin. The straight brake arm is 0.7 m long and placed perpendicular to the diameter that bisects the angle of contact. (a) What is the pull necessary on the end of the brake arm to stop the wheel if 30 kW is being absorbed? (b) What width of steel band of 2.5 mm thick is required for this brake if the maximum tensile stress is not to exceed 50 MPa?
6. Design a helical tension spring for a spring loaded safety valve so as to meet the following requirements :
   1. Diameter of valve seat = 70 mm
   2. Operating pressure(when valve begin to lift) = 0.7 N/mm2
   3. Maximum pressure(when valve blow of freely) = 0.75 N/mm2
   4. Lift a valve during change of pressure = 4mm
   5. Permissible shear stress,  = 560 MPa.
   6. Take G = 0.84×105 MPa, and C=6
7. A journal bearing of 50 mm diameter and 80 mm long, has a bearing pressure of 6 N/mm2. The speed of journal is 1000 rpm. The ratio of journal diameter to the diametric clearance is 1000. The bearing is lubricated with oil, whose absolute viscosity at the operating temperature of 75°C may be taken as 0.015 kg/m-s. The room temperature is 25°C. Determine i. The amount of artificial cooling required ii. The mass of the coolant oil required, if the difference between the outlet and inlet temperature of oil is 10°C. The specific heat of oil is 1900 J/kg/°C and heat dissipation coefficient is 500W/m2/°C.
8. Design a wire rope for a vertical mine hoist to lift a load of 50 kN, from a depth of 250 m. Rope speed of 8 m/s is to be attained in 10 seconds. Take Factor of Safety as 6.
9. A cast steel spur pinion (ƒãd = 200 MPa) running at 450 rpm transmits 20 kW power to a cast iron gear (ƒãd = 80 MPa) running at approximately 112 rpm. The load is steady. Design the drive and check for dynamic and wear loads.
10. A cast steel spur pinion (d = 200 MPa) running at 450 rpm transmits 20 kW power to a cast iron gear (d = 80 MPa) running at approximately 112 rpm. The load is steady. Design the drive and check for dynamic and wear loads.
11. A single cylinder 4-stroke IC engine develops 20 kW at 240 rpm. The work done by the gases during expansion stroke is 2.5 times the work done on the gases during the compression stroke; the work done during the suction and exhaust strokes being negligible. If the total fluctuation of speed is not to exceed ±2% of the mean speed, and the turning moment diagram during compression and expansion is assumed to be triangular in shape. Determine the moment of inertia of the flywheel.
12. A multi-disc clutch consisting of 5 steel plates and 4 bronze plates. The inner and outer diameters of the friction lining are 70 mm and 140 mm respectively. The coefficient of friction is 0.1 and maximum intensity of pressure is 0.25 N/mm2. Assuming uniform wear theory, determine i. The operating force required ii. The power transmitting capacity of the drive at 760 rpm.