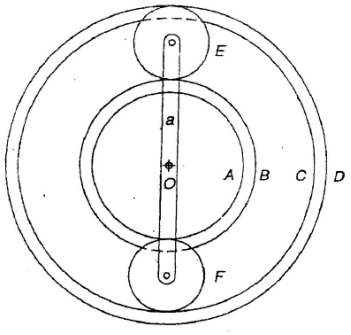
Theory of Machine-II
Sem-V [Mechanical Engg.]
Assignment No. 3
[Gear Trains & Static and dynamic force analysis]

1. a) An internal wheel 'B' with 80 teeth is keyed to shaft 'F'. Another fixed internal wheel 'C' with 82 teeth is concentric with wheel 'B'. A compound wheel 'DE' gear with the two internal wheels, wheel 'D' has 28 teeth and gears with 'C' while 'E' gears with 'B'. The compound wheel revolves freely on a pin which projects from a disc keyed to shaft. 'A' is coaxial with shaft 'F'. If the wheels all have the same pitch and shaft 'A' makes 800 rpm, what is the speed of shaft 'F'?
If the input torque to shaft 'A' is 60 Nm, what is the total load torque on the shaft 'F' and holding torque on wheel 'C'?

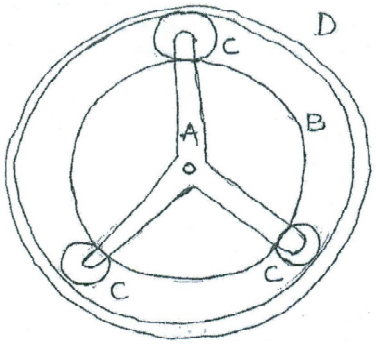
   b) In the epicyclic gear train as shown in figure, the compound wheel A and B as well as internal wheel C and D rotate independently about axis 'O'. The wheels E and F rotate on the pin to arm A. All the wheels are of the same module and number of teeth on the wheels are;

   T_A=52; T_B=56; T_E & T_F=36 ;

   Determine the speed of 'C' if 1) The wheel D is fixed and arm A rotates at 200 rpm clockwise
   2) The wheel D rotates at 20 rpm counter clockwise & the arm roattes at 200 rpm clockwise.



2. a) In an epicyclic gear of the sun and planet type as shown in figure. , the PCD of the internally toothed ring is to be 224 mm and the module 4 mm. When the ring D is stationary, the spider A, which carries three planet wheel C of equal size, is to make one revolution in the same sense as the sun wheel B for every five revolutions of the driving spindle carrying the sun wheel B. Determine the suitable number of teeth for all the wheels.



b) A punching press is required to punch 40 mm dia. Holes in a plate of 15 mm thickness at the rate of 30 holes per min. It requires 6 Nm of energy per mm^2 of sheared area. If punching takes 1/10 sec. and the rpm of the flywheel varies from 160 to 140. Determine the mass of the flywheel having radius of gyration of 1meter.

3. a) The crankpin circle of a horizontal engine is 300 mm. The mass of the reciprocating parts is 250 kg. When the crank travel 60^0 from I.D.C., the difference between the driving and the back pressure is 0.35 N/mm^2. The Connecting rod length between the centres is 1.2 m and the cylinder bore is 0.5 m. If the engine runs at 250 rpm and the effect of piston diameter is neglected, Calculate: i) Piston effort ii) Thrust in the connecting rod, iii) Turning moment on the crank shaft.

   b)The connecting rod of a gasoline engine is 300 mm long between centres. It has a mass of 15 kg and mass moment of inertia of 7000 kg-mm^2. Its centre of gravity is at 200 mm from its small end center. Determine the dynamically equivalent two mass system of the connecting rod if one of the mass is located at the small end center.