1. (30) True or false?

Parts (a) to (c) refer to the SVAJ diagrams shown in Fig.1.

(a) The motion pattern of the follower is Rise-Dwell-Fall-Dwell.
(b) The figures indicate a modified trapezoidal cam design.
(c) This cam design is acceptable.

(d) The cam shown in Fig.2 is force-closed.
(e) The pressure angle for the cam in Fig. 3 is always 90°.
(f) The speed of a translating follower depends on the angular velocity of the cam.
2. The figure shows a planetary gear train.
   (a) (10) Draw a simplified schematic diagram representing this design.
   (b) (20) Let the tooth numbers be \( N_s = 40 \), \( N_p = 20 \) and \( N_R = 80 \). Determine the speed (magnitude and direction) of the planet carrier (arm) if the sun gear rotates counterclockwise at 100 rpm and the ring gear rotates clockwise at 300 rpm.

3. For the gear train shown,
   (a) (10) What is the name given to this particular gear configuration?
   (b) (20) If input shaft 1 rotates at 2000 rpm, \( N_1 = 20 \) and \( N_4 = 40 \), determine the highest and lowest output speeds obtainable if the tooth numbers for gears 2 and 4 are to be no less than 20 and no more than 60. All gears have the same module.

4. (10) The figure shows a wheel-disk drive. This type of transmission provides stepless speed changing and reversing. The wheel (1) traces a circular path of radius \( r_2 \) on the disk (2). For a given input speed, the output speed can be varied by displacing the input shaft axially, thereby changing \( r_2 \). Determine an equation for the output/input speed ratio.