

PROBLEMS-CHAPTER I

1- A guide pin is required to align the assembly of a two-part fixture. The nominal size of the pin is 15 mm. Make the dimensional decisions for a 15-mm basic size locational clearance fit. (15.018 mm, 15.000 mm, 15.000 mm, 14.989 mm)

2- An interference fit of a cast-iron hub of a gear on a steel shaft is required. Make the dimensional decisions for a 45-mm basic size medium drive fit. (45.025 mm, 45.000 mm, 45.043 mm, 45.059 mm)

3- A pin is required for forming a linkage pivot. Find the dimensions required for a 50-mm basic size pin and clevis with a sliding fit. (50.025 mm, 50.000 mm, 49.991 mm, 49.975 mm)

4- A journal bearing and bushing need to be described. The nominal size is 1 in. What dimensions are needed for a 1-in basic size with a close running fit if this is a lightly loaded journal and bushing assembly? (1.0013 in, 1.000 in, 0.9992 in, 0.9984 in, 0.9984 in.)

5- A gear and shaft with nominal diameter of 1.5 in are to be assembled with a *medium drive fit*, as specified in Table 7–9. The gear has a hub, with an outside diameter of 2.5 in, and an overall length of 2 in. The shaft is made from AISI 1020 CD steel, and the gear is made from steel that has been through hardened to provide $S_u = 100$ kpsi and $S_y = 85$ kpsi.

(a) Specify dimensions with tolerances for the shaft and gear bore to achieve the desired fit. (1.501 in, 1.500 in, 1.5023 in, 1.5017 in)

(b) Determine the minimum and maximum pressures that could be experienced at the interface with the specified tolerances. (14 720 psi, 4480 psi)

(c) Determine the worst-case static factors of safety guarding against yielding at assembly for the shaft and the gear based on the distortion energy failure theory. (3.9, 2.1)

(d) Determine the maximum torque that the joint should be expected to transmit without slipping, i.e., when the interference pressure is at a minimum for the specified tolerances. (9500 lbf · in)