

重庆大学《机械原理》课程试卷

A 卷

B 卷

2017—2018 学年第 2 学期

开课学院：UC 课程号：ME31803

考试日期：20180428

考试方式：开卷 闭卷 其他

考试时间：90 分钟

题号	一	二	三	四	五	六	七	八	九	十	总分
得分											

备注：

1. 使用试卷标准格式命题时，大标题一律采用四号宋体、小标题及正文用小四号宋体；
2. 每套试卷满分应该为 100 分；在每大题的题号后面括号内标明该题的分数值；
3. 打印试题时按 A4 纸缩小打印，制卷时再统一按比例放大；试卷原则上要求单面印刷，按份装订。

(以上红色字体为命题时参考内容，命题完成后打印前请删除掉)

考试提示

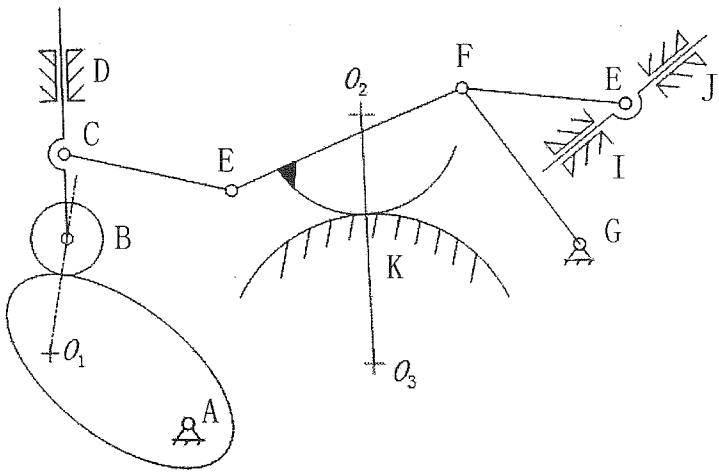
1. 严禁随身携带通讯工具等电子设备参加考试；
2. 考试作弊，留校察看，毕业当年不授学位；请人代考、替他人考试、两次及以上作弊等，属严重作弊，开除学籍。

TASK-1 (20points)

Determine the number of degrees of freedom (DOF) of the mechanism as show in the figure. Mark out the compound hinges, the isolated (local) degrees of freedom and/or the redundant constraints in the figure (if exist).

Dismember the mechanism into Assur kinematic chains, and the initial links are assumed by

yourself. Determine the class of the mechanism.



TASK-2 (30 points)

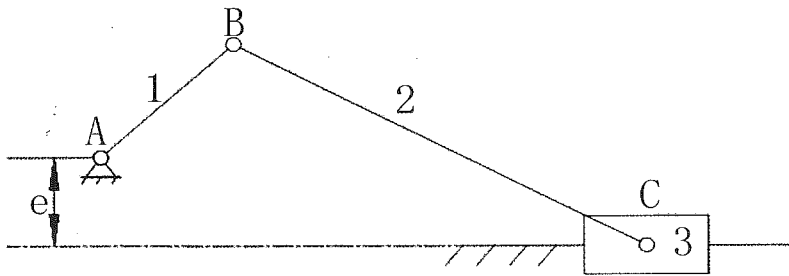
Assume that the length of each link of mechanism shown in the figure below, Known link AB angular velocity ω_1 and ϵ_1 by yourself.

Solve graphically (with instant centers) ω_2, v_3

Solve graphically ϵ_2, a_3

Draw imbalance angle θ :

Determine Time ratio K, Y_{min}



TASK-3 (20points)

Short Answer Questions

- (1) For two cams have the same actual profile and different roller radius, are the law of motion of the followers same? And for two cams have the same theory profile and different roller radius, are the law of motion of the followers same? Why? (Mark: 6 points)
- (2) What is the difference between the reference circle and the pitch circle, the pressure angle and the meshing angle in the spur gear drive? Under what condition is the reference circle coincides with the pitch circle? Under what

condition does the pressure angle equal to the meshing angle? (Mark: 7 points)

(3) For one standard helical gear, the normal pressure angle $\alpha_n = 20^\circ$, teeth number $z = 15$, helical angle $\beta = 20^\circ$. Questions: whether will it generate undercutting by using the gear hobbing process? What is the reason? (Mark: 7 points)

TASK-4 (15 points)

Answer the following questions according to the Figure 1,:

- 1) **Draw** the theory profile of cam shown in the figure 1. (Mark: 3 points)
- 2) **Draw** the radius of base circle r_b 、lift h 、rise angle Φ 、high dwell angle Φ_s 、fall angle Φ' 、low dwell angle Φ_s' . (Mark: 4 points)
- 3) **Draw** the displacement s and pressure angle α at the position shown in figure. (Mark: 4 points)
- 4) **Draw** the displacement s and pressure angle α at the position after the cam turns around 90° (Mark: 4 points)

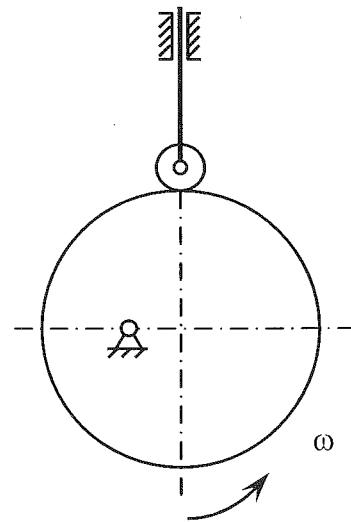


Figure 1

TASK-5 (15 points)

As shown in the figure, the involute spur gears are used in the system. The teeth number are: $z_1 = 16$, $z_2 = 32$, $z_3 = 22$, $z_4 = 27$, respectively. Of these four gears, the modulus

of each gear is $m = 5 \text{ mm}$, the pressure angle is $\alpha = 20^\circ$, $h_a^* = 1.0$, $c^* = 0.25$. The center distance of gear 1 and 2, 3 and 4 are $a'_{12} = a'_{34} = a' = 120 \text{ mm}$.

Questions:

- 1) To design the modification coefficient of each gear avoiding the undercutting. (Mark: 7 points)
- 2) To calculate the radius of gear pitch circle. (Mark: 8 points)

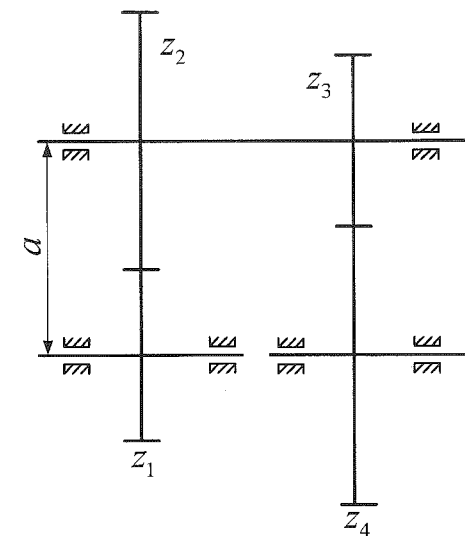


Figure 2