PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

Mid-term Examination: Semester 2

Date: December 19, 2006

Subject: 226-305 Machine Design

Academic Year: 2006

Time: 13:30-16:30

Room: R200

Instructions

- Books, sheets of paper note are allowed.
- Dictionary and calculator are allowed.
- There are 4 problems in 10 pages.
- Answer all problems in these sheets.
- Total score is 100.
- Your answers could be in English or Thai.
- Please check all questions before start working.

Name: .... | Student ID...........................

Problem	Full Score	Assigned Score
1	25	
2	25	
3	25	
4	25	
Total	100	

Mr.Srisit Chianrabutra

ทุจริตในการสอบโทษขั้นต่ำ คือ พักการเรียน 1 ภาคการศึกษา และปรับตกในรายวิชา

Problem 1: Explain 5 figures from given 6 figures, must be extended from handout. (25 points; General Understanding)
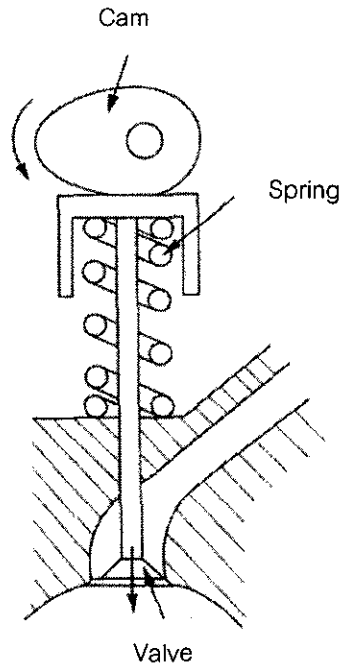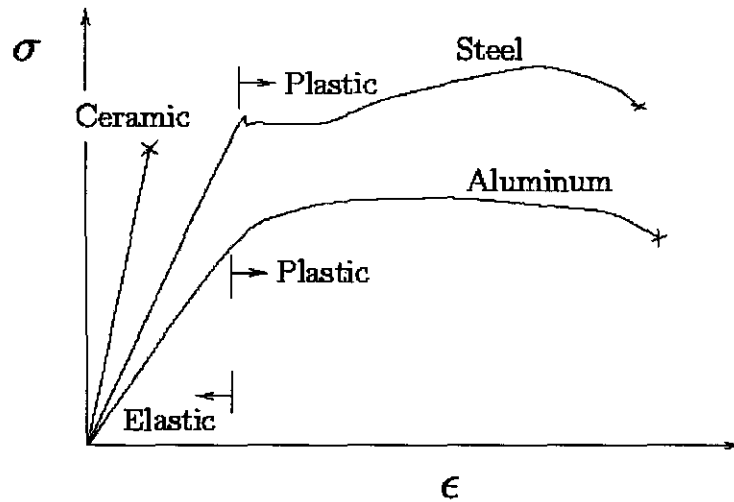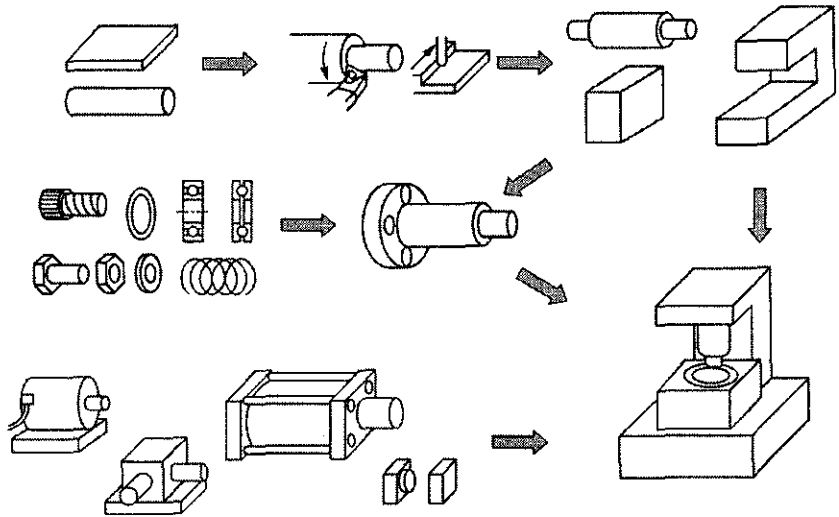

Figure 1: For problem 1

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Figure 2: For problem 1

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Figure 3: For problem 1

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Figure 4: For problem 1

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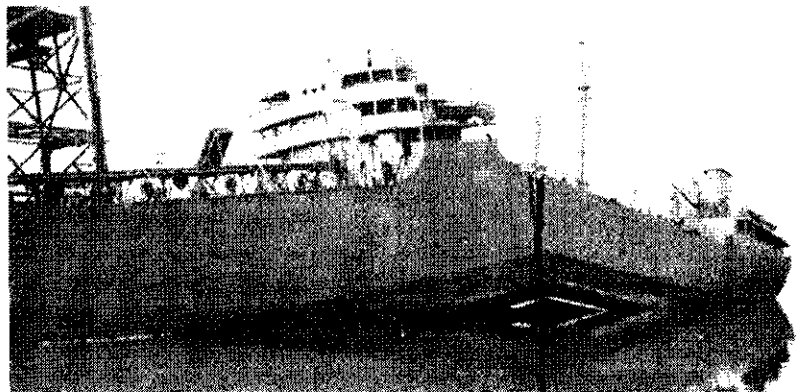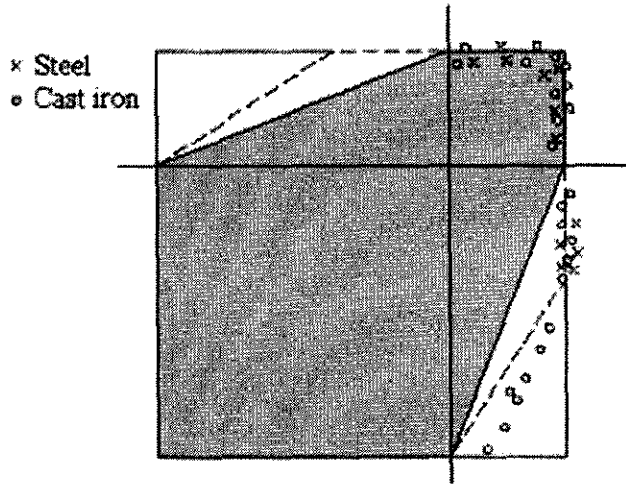
Figure 5: For problem 1

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Hand Pruning Spring   ## Car Crankshaft
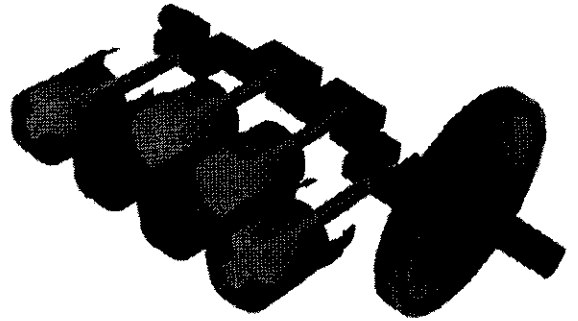
Figure 6: For problem 1

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Problem 2: AISI 1040 Steel with minimum S_y = 86 kpsi, and S_u = 113 kpsi. Find

maximum force F before yielding occurs at point A. (25 points; Static Failure Theories)

a). Use Maximum Shear Stress Theory.

b). Use Distortion Energy Theory.

c). Determine F if Safety Factor is 2.
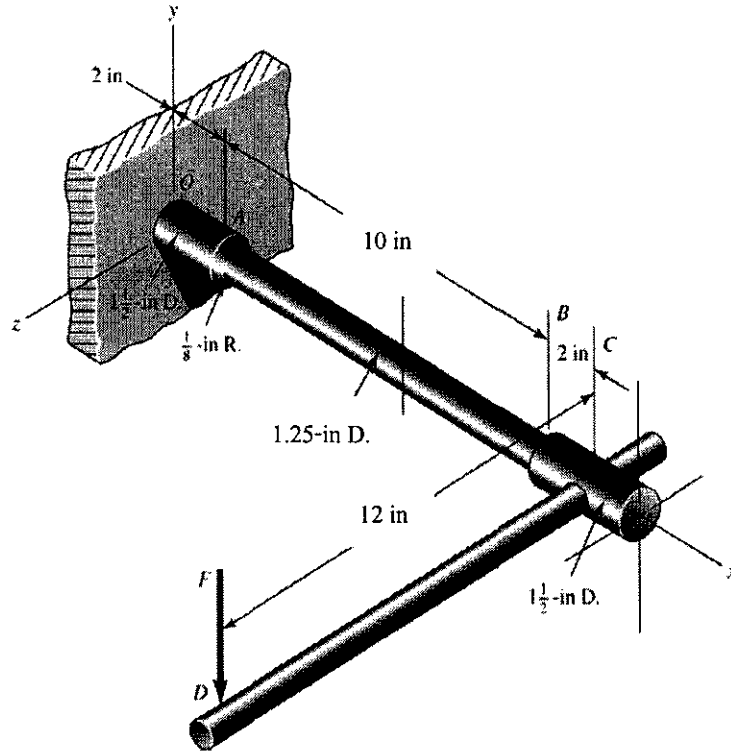
Problem 3: A shaft is subjected to a maximum load of 10 kN. It is designed to withstand a load of 15 kN. If the maximum load encountered is normally distributed with a standard deviation of 2.5 kN, and if shaft strength is normally distributed with a standard deviation of 2.0 kN, (25 points; Reliability)

a). What failure percentage would be expected?

b). How many shafts will be failure if there are 800 shafts in used.

c). Determine the shaft strength if 8 in 800 shafts can be failure.

Number of standard deviations, k
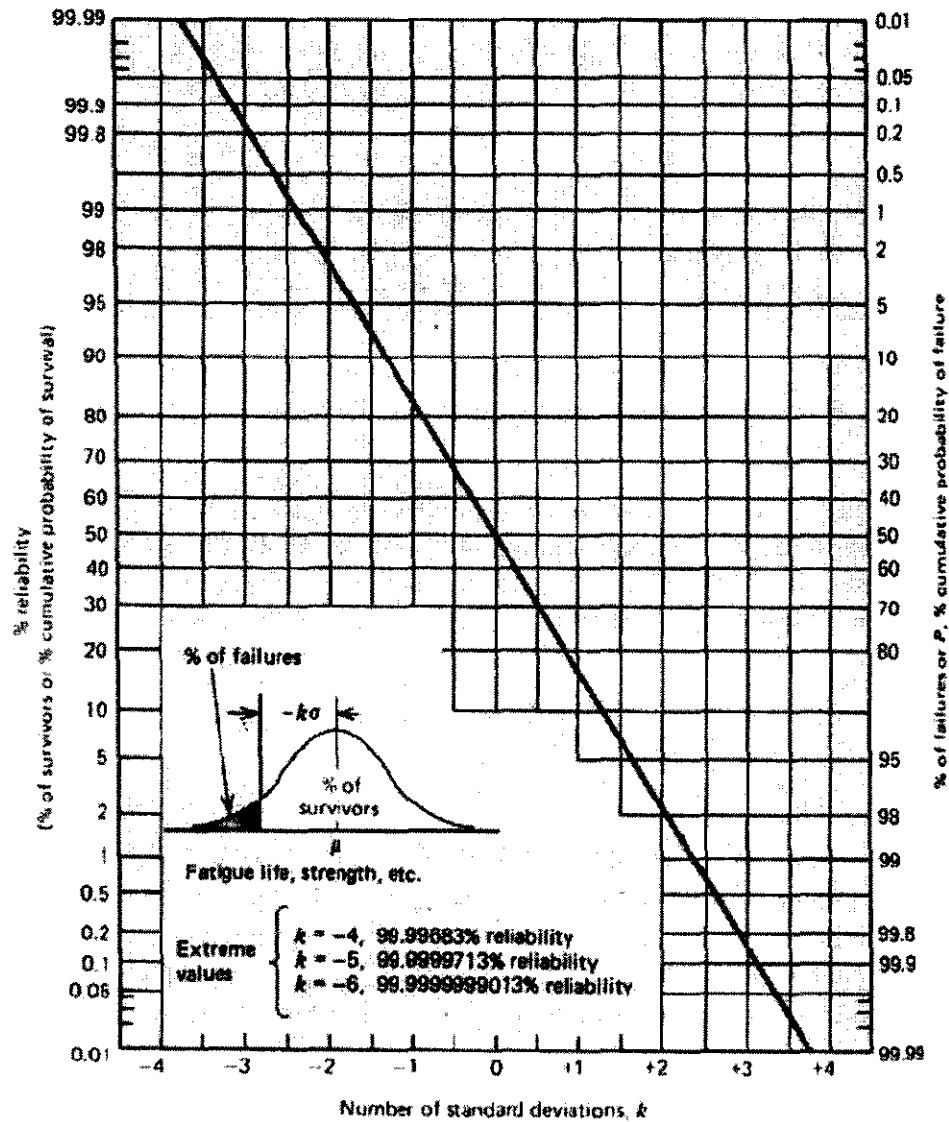
Problem 4: A 1018 hot-rolled steel bar has a diameter of 2.5 in. (S_{ut} = 58 kpsi., S_y = 32 kpsi., H_B = 116) It is to be placed in reversed axial loading such that σ_{min} = -10 kpsi. And σ_{max} = 30 kpsi. And operating environment of $400°$ F. Using ASTM minimum properties, and a reliability of 90 percent. (25 points; Fatigue Failure Theories)

a). Estimate the endurance limit of this bar.

b). Estimate the number of cycles to a fatigue failure using Modified Goodman criterion.

c). Estimate the number of cycles to a fatigue failure using Gerber criterion.