Name: ……………………………………………………………………..…...…..ID. : …………………………..

Major: ………………………………………....

Prince of Songkla University

Faculty of Engineering

Final Examination Semester 2 Academic Year : 2003

Date : 20 February 2004 Time : 13.30-16.30

Subject : 226-305 Machine Design I Room : R300

ทุจริตในการสอบ โทษขั้นต่ำปรับตกในรายวิชานั้น และพักการเรียน 1 ภาคการศึกษา โทษสูงสุดให้ออก

Instruction

1. There are 5 questions , 180 marks.
2. Attempt to do all questions in test paper. If it isn't enough, you can use other blank pages.
3. Books, sheets of paper note ,a dictionary and a calculator are allowed.
4. Don't write in red pen.

No.	**Full Score**	**Marks**
1	40	
2	40	
3	30	
4	35	
5	35	
Total	**180**	

Mr . Pichet Trakarnchaisiri

Lecturer

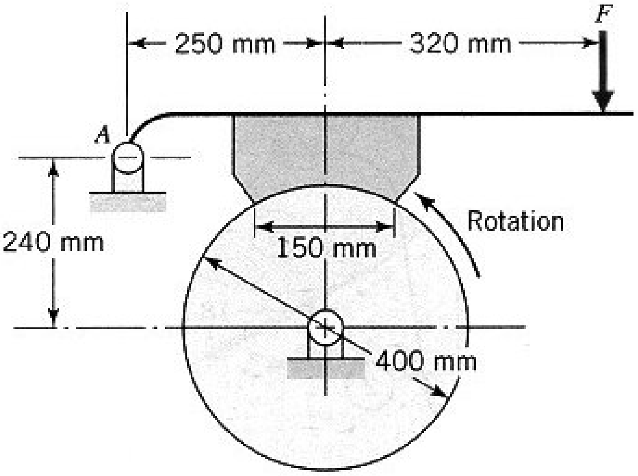
1. A brake with one shoe (a second shoe would normally be used to balance the forces, but only one shoe is shown here to keep the problem short). The width of shoe contact with the drum is 40 mm. The friction material provides a coefficient of friction of 0.3, and permits a maximum pressure of 600 kPa, based on the projected area of contact. Use the short-shoe approximate relationships. The initial drum speed is 1200 rpm. (40 marks)

   Determine

   1.1 Find θ_1 ,θ_2 ,θ_a of hand brake. (10 marks)

   1.2 What value of force F can be applied without exceeding the allowable contact pressure? (24 marks)

   1.3 What is the resulting brake torque? (6 marks)



2. Cantilever member is welded with fillet weld shown in figure below. Using E6012 welding rod (S_y = 345 MPa) and a safety factor of 2.5 based on yielding. (40 marks)

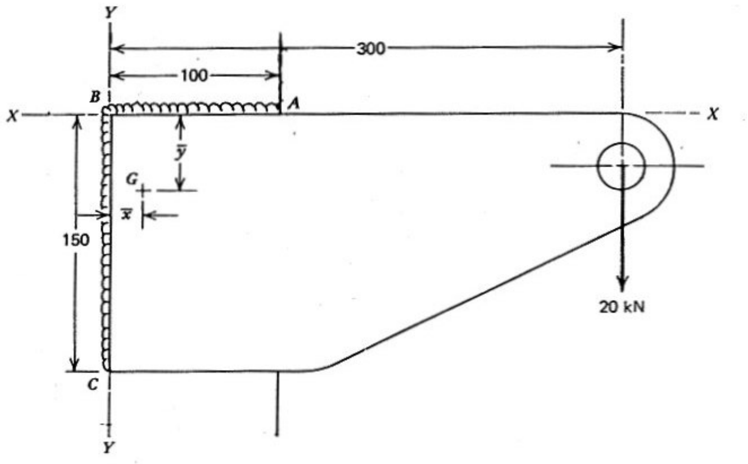
Assumption : - The cantilever member itself doesn't fail. It will occur in the weld area.

- The direct shear stress in the weld is given by V/A where V is the shear force of 20 kN and A is the weld area.
- The distortion energy theory is applicable.

2.1 Find G($\bar{x}, \bar{y}$) , J_u of weld pattern. (6 marks)

2.2 What are the resultant share forces at point A and C? (29 marks)

2.3 Determine the required weld size for weld pattern. (5 marks)



3. Select KOYO single rows deep groove ball bearings for machinery with light impact ($K_a = 1.25$). and reliability of bearings 95%. The radial load, Fr = 2500 N. and axial load, Fa = 1500 N. supported shaft diameter 40 mm. by inner ring rotates at maximum shaft speed is 1,000 rpm and diameter of outer ring are between 80-90 mm. (30 marks)

   Determined

   3.1 The required bearing life for bearing life 2500 hr. (3 marks)

   3.2 The bearings number should be selected. (3 marks)

   3.3 What is the appropriate bearing number? Please show the method to select it.
   Find the equivalent load and the required design rating of these bearing. (24 marks)

4. A 10-hp AC normal torque motor running at 1750 rpm is to be used to drive a rotary pump which operate 24 hr per day. The pump should run at approximately 1000 rpm. The center distance should not exceed 30 in. Space limits the diameter of the driven sheave to 11.5 in. (35 marks)

   Select V-belt(s) arrangement to handle this job. (35 marks)

   4.1 The design power and type of V-belt(s) (3 marks)

   4.2 The suitable diameter of driving and driven shave. (6 marks)

   4.3 Check all parameters of setting V-belt to be consistent with the condition of design. If not, please change them to corrected design values. (4 marks)

   4.4 Determine the standard pitch length and true center distance. (15 marks)

   4.5 The amount of V-belt(s) used in transmitting power. (7 marks)

5. A 57-tooth spur gear is in mesh with 27-tooth pinion. The $p_d = 6$ and $\phi = 25°$ (35 marks)

    5.1 Find the circular pitch, pitch diameter, addendum, dedendum, clearance and whole depth. (14 marks)

    5.2 Find the base pitch and contact ratio. (9 marks)

    5.3 What will the pressure angle be if the center distance of the spur gearset is increased by 5%? (6 marks)

    5.4 What types of gear train and number of stage for an overall ratio of approximately 4.5 : 1. By using these spur gears to design gear train. Please specify tooth numbers for each gear in the train. (6 marks)