

Prince of Songkla University

Faculty of Engineering

Final Examination Semester 1

Academic Year : 2006

Date : 9 October 2006

Time : 09:00 – 12:00

Subject : 226-305 Machine Design I

Room : Robot

Instruction

1. There are 6 questions, 240 marks.
2. Attempt to do all questions in the space provided. You may use other blank pages if necessary.
3. Books, sheets of paper note, a dictionary and a calculator are allowed.
4. Do not write in red.

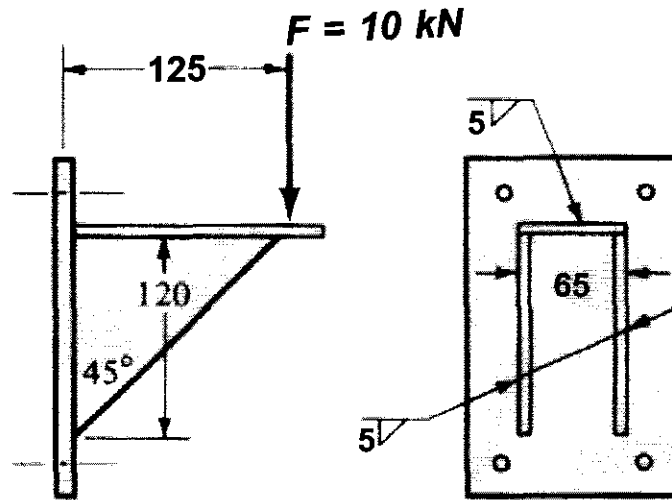
No.	Full Score	Marks
1	40	
2	40	
3	40	
4	40	
5	40	
6	40	
Total	240	

Mr. Srisit Chianrabutra

Lecturer

H.A.D.

1. The figure shows a welded steel bracket loaded by the static force F . What is the allowable shear stress, if the factor of safety in the weld metal is 6 (40 marks)



N/A

Name: ID. :

Major:

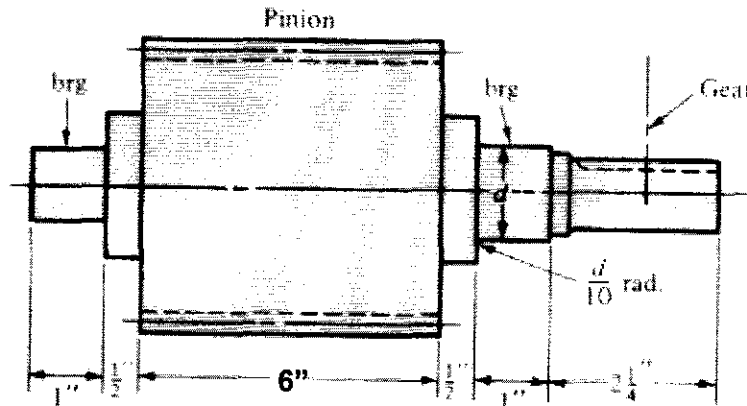
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2. Select single rows deep groove ball bearings for machinery with light impact ($K_a = 1.25$) and reliability of bearings is 96%. The radial load of $F_r = 2,000$ N. and axial load of $F_a = 1,500$ N. support shaft diameter of 40 mm. by an inner ring. The shaft rotates at a maximum speed of 1,250 rpm. (40 marks)

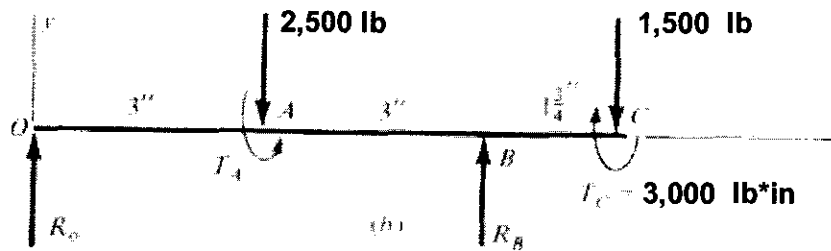
Determined

- 2.1 The required bearing life for bearing life 5,000 hr. (5 marks)
- 2.2 The bearings number should be selected. (5 marks)
- 2.3 What is the appropriate bearing number? Show the method how to select it. Find the equivalent load and the required design rating of these bearing. (30 marks)

3. The integral pinion shaft shown in Fig.a is to be mounted in bearings at the locations shown and is to have a gear (not shown) mounted on the right-hand, or overhanging, end. The loading diagram (Fig.b) shows that the pinion force at A and the gear force at C are in the same xy plane. Equal and opposite torques T_A and T_C are assumed to be concentrated at A and C, as are the forces. Find the diameter d of the shaft at the right-hand bearing based upon a material having a yield strength of 70 kpsi and using a factor of safety of 2.50. (40 marks)



(a)



(b)

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Major:

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4. A 800 rev/min 55-hp squirrel-cage motor is to drive a light duty reciprocating pump with some impact which is to be located out-of-doors under a shed. The pump is to run at full load for 8 hr/day, and freedom from breakdowns is especially desired. The pump speed is 200 rev/min.

Select V-belt(s) arrangement to handle this job. (40 marks)

- 4.1 What is the design power and type of V-belt(s) (5 marks)
- 4.2 Determine the diameter of driving pulley and driven pulley (5 marks)
- 4.3 Determine the standard pitch length and true center distance. (15 marks)
- 4.4 The number of V-belt(s) used in transmitting power. (15 marks)

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Major:

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5. A 800 rev/min 55-hp squirrel-cage motor is to drive a light duty reciprocating pump with some impact which is to be located out-of-doors under a shed. The pump is to run at full load for 8 hr/day, and freedom from breakdowns is especially desired. The pump speed is 200 rev/min. (40 marks)

5.1 Select suitable chain and sprocket sizes of driver and driven. (20 marks)

5.2 Select the center distance of standard chains. (20 marks)



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Major:

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6. A gearset consists of a 16-tooth pinion driving a 40-tooth gear. The diametral pitch is 3, and the addendum and dedendum are $1/P$ and $1.25/P$, respectively. The gears were cut using a pressure angle of 20° . (40 marks)

6.1 Compute the circular pitch, the center distance, the addendum, the dedendum, the clearance circle, the radii of the base circles, and the contact ratio. (30 marks)

6.2 In mounting these gears, the center distance was incorrectly made $\frac{1}{4}$ in larger. Compute the new values of the pressure angle and the pitch-circle diameters. (10 marks)