Menoufiya University
Faculty of Engineering
Shebin El-Kom
First Semester Examination
Academic Year:2013-2014

Menufia University
Faculty of engineering
Shebin El-Kom

Dep. of Production Eng. & Mech .Design
Year: 3rd
Subject/Code: Mechanical DesignPRE311
Time: 4 Hours
Date: 20-1-2014   Total Marks:140

Allowed Table (None)
This Exam measures ILOS no:(a_1,a_{13},b_2,b_6,b_{17},c_1,c_3)
Answer all the following Questions

(NOTE) Assume any missing data you need in its convenient range

Question(1)

1) Design hydraulic circuit if a load affecting a working cylinder continuously .the cylinder must be protected from lowering due to leakage with control valves. Using the following data, Maximum force at the piston 50 ton

Modulus of elasticity E= 2.06X10^6 kg/cm^2 for steel C60

Explain with drawing:

a- Hydraulic circuit using standards notation .   [5 marks]

b-Make design calculation and construction of hydraulic cylinder-piston-rod

Cover and choose suitable sealing and pressure.   [20 marks]

c-Construct disc seat valve in two cases (open& closed pressure port) with

symbols.   [10marks]

d-The piston speed in a single acting cylinder is to be adjustable and throttled
separately for the advance and return movements   [5marks]

Question(2)

1-Explain with drawing types of clutch and its actuating mechanisms   [20marks]

2- Design disc clutch with 4 discs under uniform pressure taking f=0.25
Diameter of shaft=6mm,dynamic factor= 1.5 for 100 Hp and 300rpm. [10marks]

QUESTION NO. 3

(20 Marks)

A pulley drive is transmitting power to a pinion, which in turn is transmitting power to some other machine element, Fig. 1. Pulley and pinion diameter are 400 mm and 200 mm respectively. SAE 1043 annealed steel (s_{yt}=240N/mm^2) is used. Shaft has to be designed for minor to heavy shock (Kb=2, Kt=1.5) and the safety factor is 2. <u>Design with construction</u> the shaft diameter and draw the bending moment diagram in the horizontal and vertical directions.
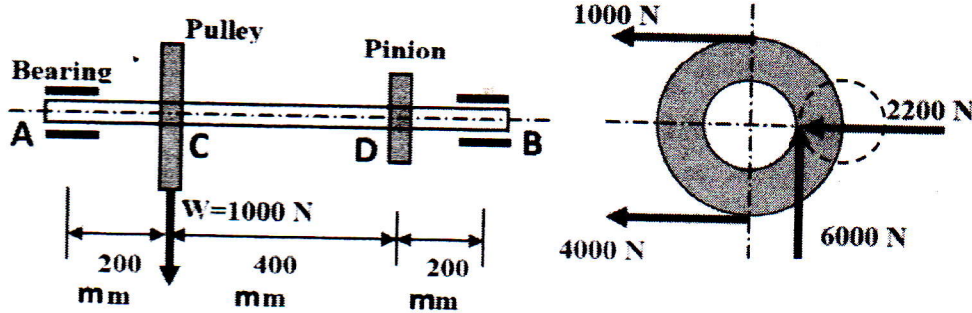

Fig. 1

QUESTION NO. 4

(30 Marks)

a) Write short notes about the following:

Sommer feld number- Equilibrium oil temperature- Rating life- Bearing damage- Rigid and flexible couplings.
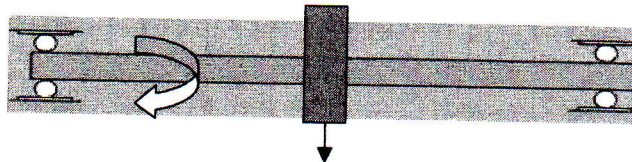(10 Marks)

b) A shaft running at 900 r.p.m is supported by bearing 5cm diameter in 10cm length. The pressure on the journal bearing is 14 kg/cm^2 and the ratio d/c =1. The viscosity of the oil is 11 centipoises at operating temperature of 75 °C and the room temperature is 33 °C. Estimated the amount of artificial cooling and the mass of the lubricating oil, if the difference between the outlet and inlet temperature of oil is 10 °C. Also, determine the minimum film thickness of oil. Take correct factor k=0.002 and heat dissipation coefficient C=0.0003kcal/min/cm^2/°C and Sp. Heat of oil as S= 0.45J/Kg/°C .
(10 Marks)

c) A simply supported shaft is shown in Fig. 2, diameter 50mm and 1m along, on bearing supports carries a load 1ton at its center. The axial load on the bearings is 300kg and the shaft speed 1440 r.p.m. The service imposes light shock and the bearing is to operate 10 hour per day for 4 year. Select single row deep grove ball bearing (e=0.25).
(10 Marks)

1 ton
Fig. 2

QUESTION NO. 5

(20 Marks)

<u>Design with construction</u> a cast iron flange coupling to transmit 15KW at 900 r.p.m from an electric motor to a compressor. The service factor may be assumed as 1.35. The following permissible stresses may be used:

The shear stress for shaft, key and bolt=40 MPa.

The crushing stress for key and bolt=80 MPa.

The shear stress for cast iron=8 MPa.

Draw two views of the flange coupling you have designed with suitable scale.

******** GOOD LUCK**********

Dr/ Fawkia Ramadan Gomaa & Dr/ Mahmoud Samir El-Wazery