TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

UNIVERSITY EXAMINATION FOR:(SCHOOL BASED)

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

EMG 2311: DESIGN OF TRANSMISSION SYSTEM

END OF SEMESTER EXAMINATION

SERIES: AUGUST 2017

TIME: 2 HOURS

DATE: Pick Date Aug 2017

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID Pocket Calculator

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question ONE

a) Give advantages of chain drives over belt drives **(7 marks)**

b) Using a schematic diagram, classify the different types of bearings **(7 marks)**

c) Give the selection criteria that are used to determine the type of fasteners used in an assembly or machine part. **(7 marks)**

d) A rope drum of an elevator having 650mm diameter is fitted with a brake drum of 1m diameter. The brake drum is provided with four cast iron brake shoes each subtending an angle of 45°. The mass of the elevator when loaded is 2000kg and moves with a speed of 2.5m/s. The brake has a sufficient capacity to stop the elevator in 2.75metres. Assuming the coefficient of friction between the brake drum and shoes as 0.2, find:

i) The width of the shoe if allowable stress on the brake is limited to $0.3N/mm^2$ and

ii) Heat generated in stopping the elevator **(9 marks)**

Question TWO

a) List designs that are used in the power transmission system **(6 marks)**

b) For the design of a power transmission system for an industrial saw that will receive 25hp from the shaft of an electric motor rotating at 1750 rpm while the drive shaft rotates at 500 rpm, with 95% efficiency and working for 16hrs daily 5 days a week, with a design life of 5yrs: which choice of power transmission system will deem suitable giving reasons. **(8 marks)**

c) Determine the maximum, minimum and average pressure in a plate clutch when the axial force is 4kN. The inside radius of the contact surface is 50mm and the outside radius is 100mm. Assume uniform wear. **(6 marks)**

Question THREE

a) A single plate clutch is to be designed for a vehicle. Both side of the plate are to be effective. The clutch transmits 30KW at a speed of 3000 rpm and should cater for an overload of 20%. The intensity of pressure on the friction surface should not exceed 0.085 MPa and the surface speed at the mean radius should be limited to 2300m/min. The outside diameter of the surfaces may be assumed as 1.3 times the inside diameter and the coefficient of friction for the surfaces may be taken as 0.3. If the axial thrust is to be provided by six springs of about 25mm mean coil diameter, design the springs selecting wire from the following gauges:

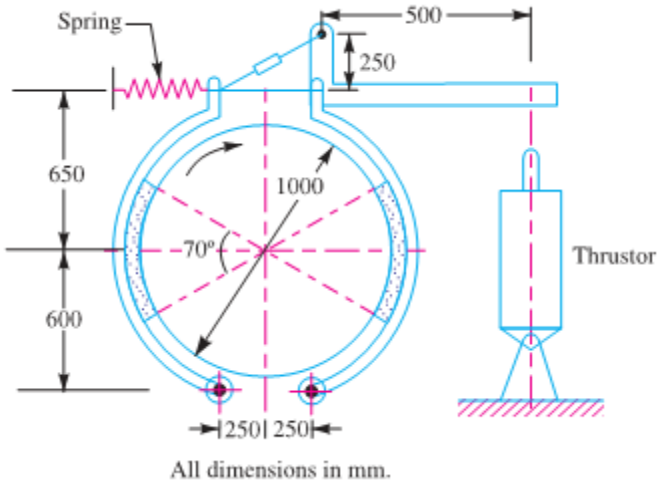
SWG	4	5	6	7	8	9	10	11	12
Dia(mm)	5.893	5.385	4.877	4.470	4.064	3.658	3.251	2.946	2.642

Shear stress is limited to 420MPa and modulus of rigidity is 84kN/mm^2

(20marks)

Question FOUR

A spring closed thrustor operated double shoe brake is to be designed for a maximum torque capacity of 3000Nm. The brake drum diameter is not to exceed 1 meter and the shoes are to be lined with Ferrodo having a coefficient of friction of 0.3. The other dimensions are as shown below:



i) Find the spring force necessary to set the brake .

ii) If the permissible stress of the spring material is 500MPa, determine the dimensions of the coil assuming the spring index to be 6. The maximum spring force is to be 1.3 times the spring force requires during braking. There are eight active coils. Specify the length of the spring enclosed in the position of the brake. Modulus of rigidity is 80kN/mm^2.

iii) Find the width of the brake shoes if the bearing pressure on the lining material is not to exceed 0.5MPa.

iv) Calculate the force required to be exerted by the thrustor to release the brake.

(20 marks)

Question FIVE

a) Design a leaf spring for the following specifications:

Total load= 140kN
No. of springs supporting the load = 4
Maximum number of leaves =10
Span of the spring = 1000mm
Permissible deflection =80mm
Take Young's Modulus, E=200kN/mm^2 and allowable stress in spring material as 600MPa. **(10 marks)**

b) Derive the formula for shaft design for a shaft experiencing combined twisting and bending moments

(10 marks)