TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology
Department of Mechanical & Automotive Engineering
UNIVERSITY EXAMINATION FOR:
BTEc. Mechanical Engineering
TMC 4222 : MECHANICS OF MACHINES II
END OF SEMESTER EXAMINATION
SERIES: APRIL 2017
TIME: 2 HOURS
DATE: Pick Date **Aug 2017**

Instruction to Candidates:

You should have the following for this examination

- *Answer booklet*
- *Non-Programmable scientific calculator*

This paper consists of **FIVE** questions. Attempt any **THREE qu**estions.
Maximum marks for each part of a question are as shown.
Do not write on the question paper.

Question ONE

A body of mass m on a plane inclined at 20^o to the horizontal and for which the coefficient of friction is μ, is acted upon by a force upwards and parallel to the plane. When this force has a value of 60 N the body slides steadily downwards; when the value is 175 N, the body moves steadily upwards. Deduce from these results the values of m and μ.

A different body, of mass 50 kg and with a surface for which, on the same plane, the coefficient of friction is 0.15, is to be moved by a force, P, directed at an angle of 15^o to the plane, i.e. at 35^o to the horizontal. Calculate the value of P which will cause steady upward movement, and also the value to which P must be reduced before downward movement becomes possible. Any formulae used should be established or explained by vector diagrams of forces. (20 marks)

Question TWO

a) A square-threaded screw of mean diameter 40mm and having 160 threads per m is used to raise a load of 7.5 kN. The nut, which rotates, has a bearing surface

whose mean diameter is 56 mm. Find the effort required at the end of a lever 300mm effective length to raise the load when μ=0 08. (10 marks)

b) A single-start thread has a mean diameter of 60 mm and a pitch of 12 mm. The section of the thread is of Acme form having a total angle of 29^o between the faces. If μ=0.05, find;

(i) The torque necessary to overcome an axial load of 30 kN

(ii) The efficiency of the thread (10 marks)

Question THREE

A plate clutch consists of a flat driven plate gripped between a driving plate and presser plate so that there are two active driving surfaces each having an inner diameter 200 mm and an outside diameter 350 mm. μ=0.4. The working pressure is limited to 170kN/m^2. Assuming the pressure is uniform, calculate the power which can be transmitted at 1000 rev/min. If the clutch becomes worn so that the intensity of pressure is inversely proportional to the radius, the total axial force on the presser plate remaining unaltered, calculate the power which can now be transmitted at 1000rev/min and the greatest intensity of pressure on the fiction surfaces (20 marks)

Question FOUR

In a belt drive, the angle of lap of the belt on the small pulley is 150^o. With a belt speed of 20 m/s and a tension in the tight side of the belt of 1.35 kN, the greatest power that can be transmitted without slip is 10 kW. What increase of power would be obtained for the same belt speed and maximum tension by using an idler pulley so as to increase the angle of lap to 210^o?Take into account the centrifugal effect, the mass of the belt being 0.75 kg/m. (20 marks)

Question FIVE

The arrangement of an internal expanding two leading shoe brake is shown in Figure Q5. When the brake is operated, fluid under pressure enters the chambers marked A and the pistons force the shoes against the inside of the brake drum which is 288 mm internal diameter. The pistons are both 30 mm diameter and the wheel to which the brake drum is fitted is 830 mm diameter. The normal reaction between the wheel and the road is 2.25 kN, the coefficient of friction between the tyre and road 0.75 and the coefficient of friction between drum and brake lining 0.3.

Determine the hydraulic pressure required to lock the wheel for the direction of rotation shown and express this as a percentage of the pressure required when the direction of rotation is reversed (20 marks)

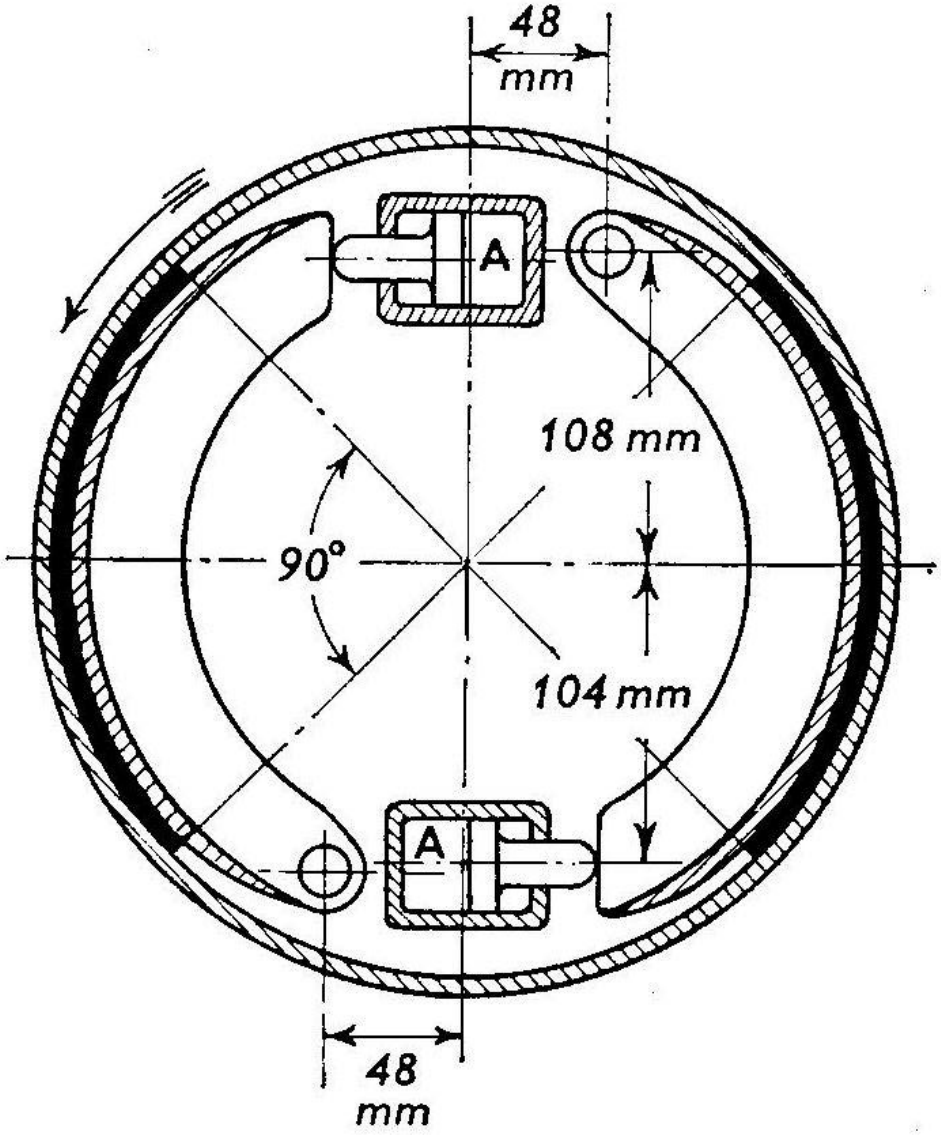

FIG Q5