Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
300 level 1st Semester Examination –Sept. /Oct. 2015
SCT366-2 Mechanics of Machines

All symbols have their usual meaning, unless defined.
Scientific Calculators are allowed.
Duration:02hour
Number of questions:04
Mark allocation:100 marks

1.

a. Show that the maximum fluctuation of energy of the flywheel, $\Delta E = mk^2\omega^2 C_s$. (5 marks)

b. The turning moment diagram for a petrol engine is drawn to the following scales: turning moment, 1 mm = 5 Nm; crank angle, 1 mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line taken in order are 295, 685, 40, 340, 960, 270 mm^2. The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 r.p.m.

(20 marks)

2.

a. Name two main types of friction and briefly describe them.

(4 marks)

b. Show that $\varphi = \alpha$ where φ is the limiting angle of friction, and α is the angle of inclination of the plane to the horizontal, the body begins to move down the plane (Figure 01).

(5 marks)

c. A body, resting on a rough horizontal plane required a pull of 180 N inclined at 30º to the plane just to move it. It was found that a push of 220 N inclined at 30º to the plane just moved the body. Determine the weight of the body and the coefficient of friction (Figure 02).

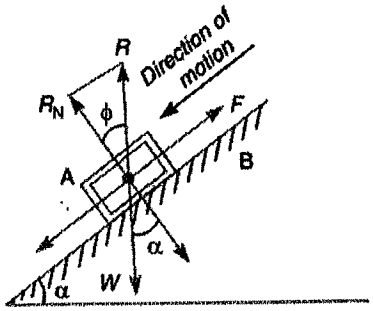

Figure 01

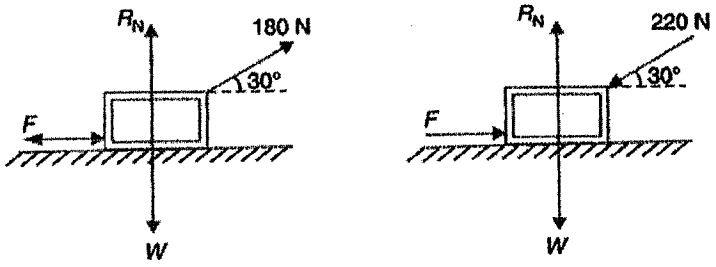

Figure 02

(16 marks)

19

3. In a four bar chain ABCD, AD is fixed and is 150 mm long. The crank AB is 40 mm long and rotates at 120 r.p.m. clockwise, while the link CD = 80 mm oscillates about D. BC and AD are of equal length and angle BAD = 60° (Figure 03).

a. Find the velocity of point B on link AB, V_B. (5 marks)

b. Draw velocity diagram using calculated V_B value. (10 marks)

c. Find the angular velocity of link CD. (10 marks)

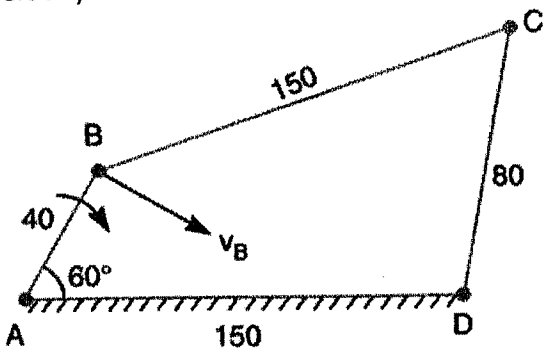

Figure 03

4.

a. Draw and name three types of belt. (6 marks)

b. Give the relation between the tight side tension (T_1) and slack side tension (T_2), in terms of the coefficient of friction (μ) and the angle of contact (θ). (4 marks)

c. Find the power transmitted by a belt running over a pulley of 600 mm diameter at 200 r.p.m. The coefficient of friction between the belt and the pulley is 0.25, angle of lap 160° and maximum tension in the belt is 2500 N. (15 marks)