SIR ISSAC NEWTON COLLEGE OF ENGINEERING AND TECHNOLOGY

PAPPAKOIL,NAGAPATTINAM

**MODEL EXAMINATION**

 SUBJECT NAME/CODE: **KINEMATICS OF MACHINERY -ME6401** TIME DURATION :**3 hrs**

DATE:**10.04.2017** MAXIMUM:**100 marks**

 **Answer ALL questions.**

 **PART-A (10×2=20)**

1. Write Grashoff s law for 4-bar mechanism
2. What is meant by indexing mechanism? Where do we use it?
3. What is a configuration diagram? What is its use?
4. Write about rubbing velocity
5. State the expressions for maximum acceleration of a follower moving with cycloidal motion.
6. What is pitch curve?
7. State the law of gearing.
8. Define Backlash
9. Differentiate between self locking and overhauling of screw.
10. List down the laws of friction.

**PART-B (4×16=64)**

1. Explain the working of two different types of quick return mechanisms. Derive an expression for the ratio of time taken in forward and return stroke for one of these mechanisms.(16)

OR

(i)What is kinematic inversion? Explain the four different inversions of slider crank mechanism. (10)

 (ii) Determine the degree of freedom for following linkages. (6)

1. (i) Derive an expression for the relationship between the angular velocities of links in terms of known link lengths, angular positions of links and angular velocity of input link, for a four—bar linkage. (6)

(ii) In a slider crank mechanism, the length of crank OB and connecting rod AB are 125 mm and 500 mm respectively. The centre of gravity G of the connecting rod is 275 mm from the slider A. The crank speed is 600 rpm clockwise. When the crank has turned 45° from the inner dead centre position, determine velocity of the slider A, Velocity of the point G and Angular velocity of the connecting rod AB (10)

OR

The crank AB of four bar mechanism shown in figure. 3. Rotates at 60 rpm clockwise. Determine the relative angular velocities of the coupler to the crank and the lever to the coupler. Find also the rubbing velocities al the surface of pins 25 mm radius and the joints B and C. (8)



(ii) Locate the instantaneous centre's of the slider crank mechanism shown in fig.4. Find the velocity of the slider.(8)

1. A cam operates on offset roller follower. The least radius of the cam is 50 mm, roller, diameter is 30 mm, and offset is 20 mm, the cam rotates at 360 rpm. The angle of ascent is 48°, angle of dwell is 42°, and angle of descent is 60°. The motion is to be SHM during ascent and uniform acceleration and deceleration during decent. Draw the cam profile. (16)

OR

A cam is to be designed for a knife edged follower with the following data:

 I. Follower lift is 40 mm with SHM, during 90° of cam rotation

 II. Dwell for the next 30°

 III. Follower returns to its original position with SHM, during next 60° of cam rotation

 IV. Dwell for the remaining cam rotation.

1. Explain the various pitches of helical gears with sketch. (10) (ii) Two 15 mm module 20° pressure angle spur gears have addendum equal to one module. The pinion has 25 teeth and the gear 50 teeth. Determine whether interference will occur or not. If it occurs, to what valve should the pressure angle be changed to eliminate interference? (6)

Two unequal gears of involute profile are to give required gear ratio. Derive an expression for the minimum number of teeth required for the pinion in order to avoid interference. (12) (ii) Two gear wheels mesh externally to give a velocity ratio of 3 to 1. The involute teeth have 6 mm module and 20° pressure angle. Addendum is equal to one module. Determine the number of teeth on pinion to avoid interference and the corresponding number on the wheel. (4)

Two pulleys, one 450 mm diameter and the other 200 mm diameter are in parallel shafts 1.95 m apart and are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt when the larger pulley rotates at 200 rpm if the maximum permissible tension in the belt is 1 kN and the co—efficient of friction between the belt and pulley is 0.25? (16)

A vertical shaft 140 mm diameter rotating at 120 rpm rests on a flat end foot step bearing. The shaft carries a vertical load of 30 KN. The coefficient of friction is 0.06. Estimate the power lost is friction, assuming uniform pressure and uniform wear. (8) (ii) A multi-plate disc clutch transmits 55 KW of power at 1800 rpm. Coefficient of friction for the friction surface is 0.1. Axial intensity of pressure is not to exceed 160 KN/m2. The internal radius is 80 mm and 0.7 times the external radius. Find the number of plates needed to transmit the required torque. (8

 \*\*\*\*\*\*\*\*\*\*\*\*\*\***HARD WORK NEVER FAILED**\*\*\*\*\*\*\*\*\*\*