b) An epicyclic gear train consists of three gears 1, 2 and 3 as shown in Fig. 2. The internal gear 3 has 32 teeth. The gear 2 meshes with both gear 1 and gear 3 and is carried on an arm, A which rotates about the center O_2 at 20 rpm. If the gear 1 is fixed, determine the speed of the gears 2 and 3. **(16)**

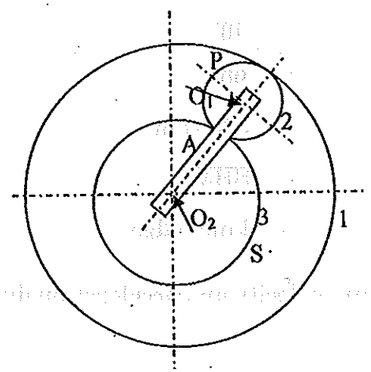

Fig. 2 problem 14 (b)

15. a) A pulley is driven by flat belt, the angle of lap being 166 deg. The belt is 12 cm wide by 7 cm thick and weighs 1.2 gm/cm^3. If the coefficient of friction is 0.26 and the maximum stresses in the belt is not to exceed 2.1 MPa, find the greatest HP, which the belt can transmit and the corresponding speed of the belt. **(16)**

(OR)

b) Outside diameter of a square threaded spindle of a screw jack is 42 mm. The screw pitch is 12 mm. If the coefficient of friction between the screw and the nut is 0.14, friction between the nut and the collar is 0.08, determine.

i) Force to be applied at the screw to raise a load of 3 kN. **(4)**

ii) Efficiency of the screw jack. **(4)**

iii) Force to be applied at the pitch radius to lower the same load of 3 kN and **(4)**

iv) Efficiency while lowering the load. **(4)**

Reg. No. : | | | | | | | | | | | | |

1/11 BN

Question Paper Code : 52837

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017
Third Semester
Mechanical Engineering
ME 2203 – KINEMATICS OF MACHINERY
(Regulations 2008)
(Common to PTME 2203-Kinematics of Machinery for B.E. (Part-Time)
Third Semester – Mechanical Engineering – Regulations 2009)

Time : Three Hours Maximum : 100 Marks

Drawing Sheet is to be supplied to the students
Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Define Grashof's law applicable for four-bar mechanism.
2. Sketch and indicate "Transmission angle" in a four bar mechanism.
3. In which of the mechanisms the coriolis component of acceleration is taken into account.
4. A point 'B' on a rigid link AB moves with respect to A with angular velocity 'ω'rad/s. What is the radial component of the acceleration of 'B' with respect to 'A' ?
5. What are the different types of followers ?
6. Name the cam follower generally used in automobile engines.
7. What is meant by pitch circle with respect to the gears ?
8. Differentiate between simple and compound gear train.
9. What is the difference between angle of friction and angle of repose ?
10. Define the slip of the belt with respect to mathematical equation.

PART – B (5×16=80 Marks)

11. a) Describe with neat sketch, the mechanisms obtained by the inversions of four-bar chain. **(16)**

(OR)

b) In a crank and slotted lever quick return motion mechanism, the distance between the fixed centers is 240 mm and the length of the driving crank is 120 mm. Find the inclination of the slotted bar with the vertical in the extreme position and the time ratio of cutting stroke to the return stroke.
If the length of the slotted bar is 450 mm, find the length of the stroke if the line of stroke passes through the extreme positions of free end of the lever. **(16)**

12. a) The crank of a slider crank mechanism rotates clockwise at a constant speed of 330 rpm. The crank is 160 mm and the connecting rod is 640 mm long. Determine : i) linear velocity and acceleration of the midpoint of the connecting rod and ii) angular velocity and angular acceleration of the connecting rod, at a crank angle of 45° from inner dead center position. **16**

(OR)

b) The dimensions and configuration of the four bar mechanism, shown in Fig. 1 are as follows :

P_1A = 300 mm; P_2B = 360 mm; AB = 360 mm and P_1P_2 = 600 mm. The angle $AP_1P_2 = 60°$. The crank P_1A has an angular velocity of 10 rad/s and an angular acceleration of 30 rad/s^2, both clockwise. Determine the angular velocities and angular accelerations of P_2B and AB and the velocity and acceleration of the joint B. **(16)**

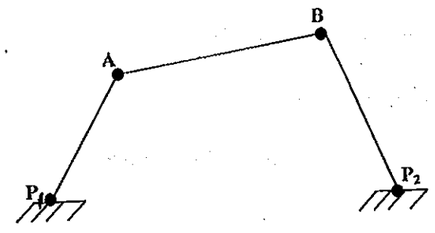

Fig. 1 Problem 12 (b)

13. a) Draw the cam profile for the data given below : **(16)**

Base circle radius of cam	=	50 mm
Lift	=	40 mm
Angle of ascent	=	60°
Angle of dwell	=	40°
Angle of descent	=	90°
Speed of cam	=	300 rpm
Motion of the follower	=	SHM
Type of the follower	=	knife-edge

Also calculate the maximum velocity and acceleration during ascent and descent.

(OR)

b) A cam rotating clockwise at a uniform speed of 1000 rpm is required to give a roller follower the motion defined below. **16**

i) Follower to move outwards through 50 mm during 120° of cam rotation,

ii) Follower to dwell for next 60° of cam rotation,

iii) Follower to return to its starting position during next 90° of cam rotation,

iv) Follower to dwell for the rest of the cam rotation.

The minimum radius of the cam is 50 mm and the diameter of the roller is 10 mm. The line of the stroke of the follower is off-set by 20 mm from the axis of the cam shaft. If the displacement of the follower takes place with uniform and equal acceleration and retardation on both the outward and return strokes, draw profile of the cam and find the maximum velocity and acceleration during outstroke and return stroke.

14. a) Two 20° involute gears in mesh have a gear ratio of 2 and 20 teeth on the pinion. The module is 5 mm and the pitch line speed is 1.5 m/s. Assuming addendum to be equal to one module, find (i) angle turned through by pinion when one pair of teeth is in mesh and (ii) maximum velocity of sliding. **(16)**

(OR)