

Ganpat University
B. Tech. SEM - III Mechanical Engineering
CBCS Regular Examination Nov/Dec- 2014
2ME304 – KINEMATICS OF MACHINES

TIME:- 3 HOURS

TOTAL MARKS:- 70

INSTRUCTIONS:-

- i. Answer to the two sections must be written in separate answer books.
- ii. Figures to the right indicate full marks of the questions.
- iii. Draw neat sketch wherever necessary.
- iv. Assume suitable data if necessary.

Section - I

Q -1 Answer the following questions.

- (A) Draw the profile of a cam rotating in anti-clock wise direction and operating a knife edge follower when the axis of the follower passes through the axis of the cam shaft from following data: [08]
1. Follower moves outwards through 30 mm during 90° of cam rotation.
 2. Follower dwells for next 120°
 3. Follower returns to its original position during next 150°
- The displacement of the follower is to take place with SHM during outward stroke and with uniform velocity during inward stroke. The least radius of the cam is 50 mm.
- (B) Explain epicyclic gear train with the help of neat sketch. Write its merits and demerits as compared to reverted and compound gear trains. [04]

OR

Q -1 Answer the following questions.

- (A) Draw the profile of a cam operating a roller follower and with the following data: [08]
Minimum radius of cam = 25 mm, Lift = 30 mm, Roller Diameter = 15 mm
The cam lifts the follower for 120° with SHM followed by a dwell period of 30°. Then the follower lowers down during 150° of the cam rotation with uniform acceleration and deceleration followed by a dwell period.
- (B) Explain with sketches the different types of cams and followers. [04]

Q -2 Answer the following questions.

- (A) In an epicyclic gear train, the internal wheels A and B and compound wheels C and D rotate independently about axis O. The wheels E and F rotate on pins fixed to the arm G. E gears with A and C and F gears with B and D. All the wheels have the same module and the numbers of teeth are: $T_C = 28, T_D = 26, T_E = T_F = 18$. [07]
- (1) Find the number of teeth on A and B.
 - (2) If the arm G makes 100 rpm clockwise and A is fixed, find the speed of B.
 - (3) If the arm G makes 100 rpm clockwise and wheel A makes 10 rpm counter-clockwise, find the speed of wheel B.

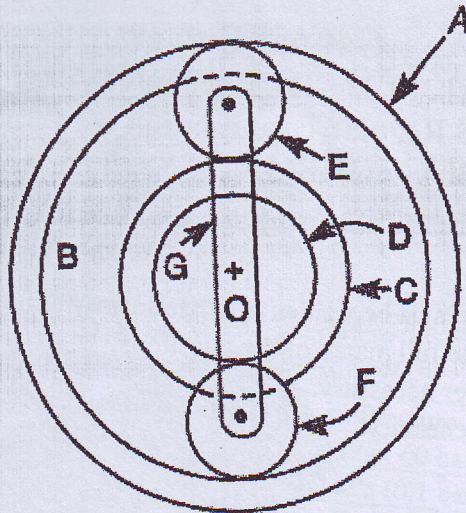


Fig. 1

- (B) Explain compound gear train with neat sketch. Also derive the equation of the velocity ratio for compound gear train. [04]

OR

Q -2 Answer the following questions.

- (A) Following data relates to reciprocating steam engine as shown in Fig. 2. [07]

Uniform speed of crank = 240 rpm, Radius of crank = 150 mm, Length of connecting rod between centre = 600 mm. Direction of rotation of crank is clockwise. When the crank has turned 30° from I.D.C.

Find:

- (1) Acceleration of piston
- (2) Acceleration of C.G. of connecting rod, C.G. being 200 mm from big end centre.

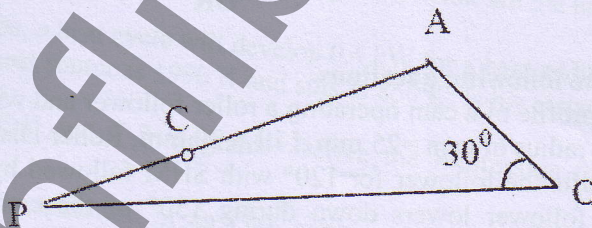


Fig. 2

- (B) Explain with a neat sketch the "Sliding Gear Box" [04]

Q -3 Answer the following questions.

- (A) In a four bar mechanism ABCD, the crank AB rotates through 10 rad/s in clockwise direction. The various dimensions of links are: Link AB = 62.5mm, Link BC = 175mm, Link CD = 112.5mm and Link AD = 200mm which is being fixed. Find [08]

1. Angular velocity and angular acceleration of link BC
2. Angular velocity and angular acceleration of link CD.

- (B) Explain with a neat sketch the "Differential Gear Box" [04]

SECTION - II

Q -4 Answer the following questions.

- (A) Draw and Explain the Inversions of the four bar chain mechanism [06]
(B) Enlist approximate straight line motion mechanism and explain any one of them. [06]

OR

Q -4 Answer the following questions.

- (A) What are the types of absorption dynamometer? Explain any one of them with neat sketch. [06]
(B) Classify and explain the follower according to shape of the follower with neat sketch. [06]

Q -5 Answer the following questions.

- (A) Derive the equations of flat collar bearing for (1) uniform pressure [05]
(2) uniform wear
(B) An Effort of 1500 N is required to just move a body up on incline plane of angle 12° , force acting parallel to the plane. If the angle of inclination is increased to 15° , then the effort required is 1720 N. find the weight of body and coefficient of friction. [06]

OR

Q -5 Answer the following questions.

- (A) Draw and Explain the Inversions of the double slider crank mechanism. [05]
(B) The diameter of the brake drum of a single block brake is 1m. It sustains 240 N.m of torque at 400 rpm. The coefficient of friction is 0.32. Determine the required force to be applied when the angle of contact is (a) 35° and (b) 100° , given that $a = 800$ mm, $b = 150$ mm and $c = 25$ mm. Assume the rotation of drum clockwise and anticlockwise. [06]

Q -6 Attempt any Three.

- (A) Enlist types of brakes. Derive all the equations of block or shoe brake with neat sketch. [12]
(B) Derive equations for band brake for $a > b$, F downwards for both rotations.
(C) Define (1) Mechanism (2) Rigid Body (3) linkage (4) Inversions
(D) State the types of friction and explain them in details.

END OF PAPER