Code No: 07A42104 **R07** **Set No. 2**

II B.Tech II Semester Examinations,APRIL 2011
MECHANISMS AND MECHANICAL DESIGN
Aeronautical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. For a symmetrical tangent cam operating a roller follower, find:

   (a) The distance between cam centre and nose centre

   (b) Nose radius

   (c) Angle of contact of cam with straight flank

   (d) The acceleration of the follower at the beginning of the lift, where the roller just touches the nose and at the apex of the circular nose if the least radius of earn = 30 mm; roller radius = 17.5 mm; angle of ascent = 75^0 and total lift = 17.5 mm. The speed of the cam shaft is 300 r.p.m. Assume that there is no dwell between ascent and decent. [16]

2. Find the velocities of points B, C, and D of the double-slider mechanism shown in the figure 2 if crank 2 rotates at 42 rad/s cw. Use instant centre method. [16]

   O_2A = 50, AB = 250, AC = 100, BC = 225, CD = 8 200.

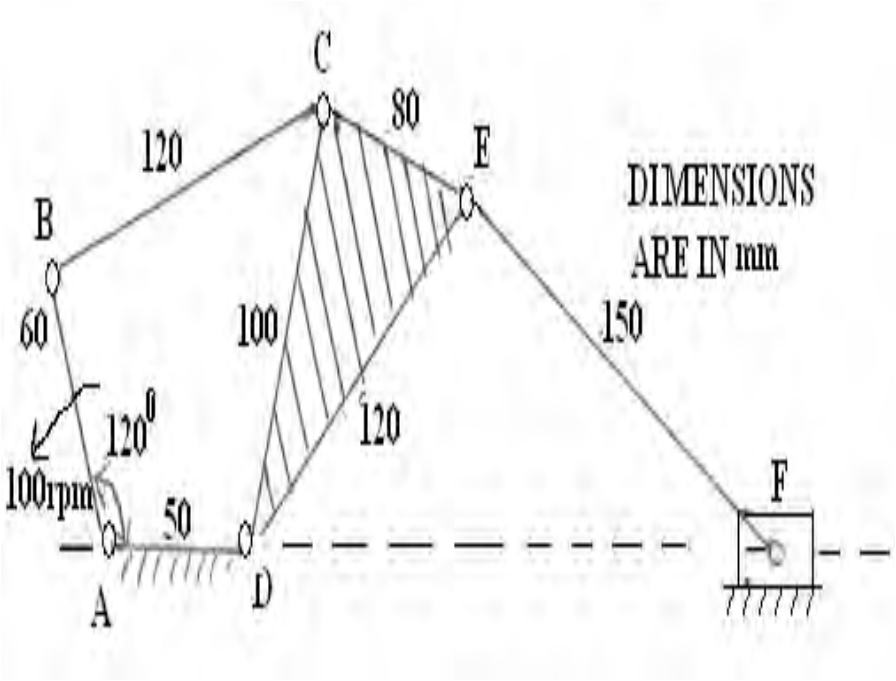

Figure 2

3. A protective flange coupling is used to connect two shafts and transmit 7.5 kW power at 720 rpm. The design torque is 150% of the rated torque .The shafts and

bolts are made of plain carbon steel 30C8 (S_{yt}= 400N/mm^2) and the made factor of safety is 5. Assume,
S_{ye} =1.5S_{yt} and S_{sy} =0.5S_{yt}
The flanges are made of cast iron.
Calculate:

(a) diameter of the shafts;

(b) number of bolts; and

(c) diameter of the bolts. [16]

4. It is required to set out the profile of a cam to give the following motion to reciprocate the follower with a flat face.

   (a) Follower to have a stroke of 30m.m. during the 120^0 rotation of the cam.

   (b) Follower to dwell for 30^0 rotation of the cam.

   (c) Follower to return to initial position during the120^0 of the earn rotation.

   (d) Follower to dwell for the remaining 90^0 rotation of the cam.

   The minimum radius of the earn is 25m.m. The motion of the follower is S.H.M. [16]

5. (a) What is a pantograph? Explain.

   (b) Two points P and Q, 40 mm apart are to be connected by a pantograph. The motion of P to the motion of Q is 13 : 7. Find the distancce of Q from the fixed point O of the pantograph such that the point P moves at least 127 mm in either direction of line OQP when it is horizontal. Find also the main dimension of the pantograph. [6+10]

6. In the mechanism shown figure6 D is constrained to move on a horizontal path. Find, for the given configuration, the velocity and acceleration of D and the angular velocity and acceleration of BD when OC is rotating in a counter-clockwise direction at a speed of 180 r.p.m., increasing at the rate of 50 rad/s^2. [16]

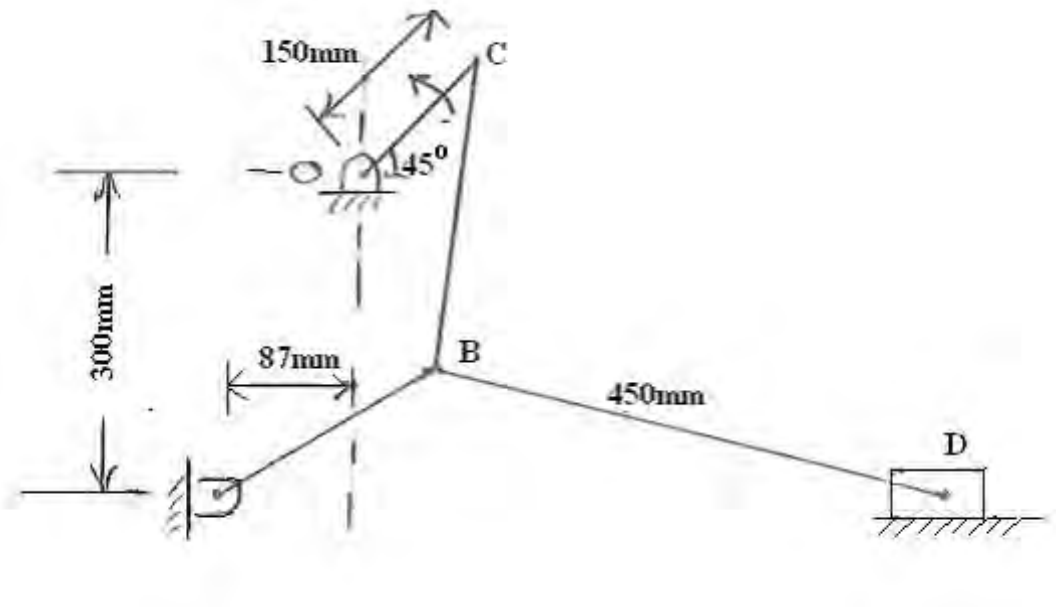

Figure 6

7. Each road wheel of a motor cycle has a mass moment of inertial of 1.5 kg-m^2. The rotation parts of the engine of the motorcycle have a mass moment of inertial of 0.25 kg-m2. The speed of the engine is 5 times the speed of the wheels and is in the same sense. The mass of the motor cycle is traveling at 50 kmph and its center of gravity is 0.6 m above the ground level. Find the angle of heel if the cycle with its rider is 250 kg and is taking a turn of m radius. The wheel diameter is 0.6m. [16]

8. (a) What is the difference between Double-helical and Herringbone gears?
   (b) Define the terms:
      i. Pitch circle
      ii. Pitch diameter
      iii. Pitch point
      iv. Circular pitch
      v. Module. [8+8]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: 07A42104 **R07** **Set No. 4**

II B.Tech II Semester Examinations,APRIL 2011
MECHANISMS AND MECHANICAL DESIGN
Aeronautical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Each road wheel of a motor cycle has a mass moment of inertial of 1.5 kg-m^2. The rotation parts of the engine of the motorcycle have a mass moment of inertial of 0.25 kg-m2. The speed of the engine is 5 times the speed of the wheels and is in the same sense. The mass of the motor cycle is traveling at 50 kmph and its center of gravity is 0.6 m above the ground level. Find the angle of heel if the cycle with its rider is 250 kg and is taking a turn of m radius. The wheel diameter is 0.6m. [16]

2. In the mechanism shown figure2 D is constrained to move on a horizontal path. Find, for the given configuration, the velocity and acceleration of D and the angular velocity and acceleration of BD when OC is rotating in a counter-clockwise direction at a speed of 180 r.p.m., increasing at the rate of 50 rad/s^2. [16]

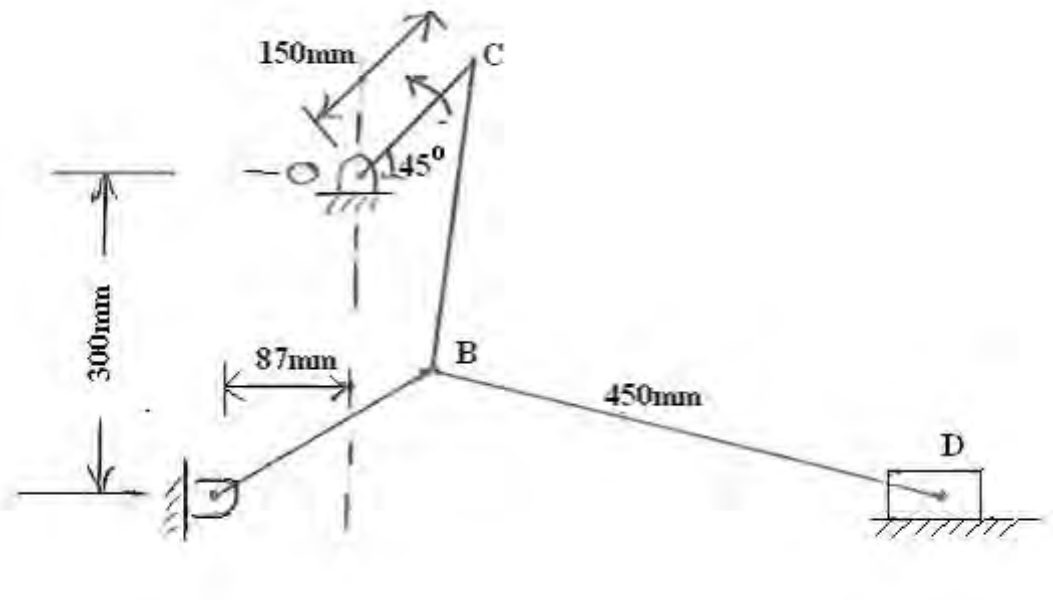

Figure 2

3. For a symmetrical tangent cam operating a roller follower, find:

   (a) The distance between cam centre and nose centre
   (b) Nose radius
   (c) Angle of contact of cam with straight flank
   (d) The acceleration of the follower at the beginning of the lift, where the roller just touches the nose and at the apex of the circular nose if the least radius

of earn = 30 mm; roller radius = 17.5 mm; angle of ascent = 75^0 and total lift = 17.5 mm. The speed of the cam shaft is 300 r.p.m. Assume that there is no dwell between ascent and decent. [16]

4. Find the velocities of points B, C, and D of the double-slider mechanism shown in the figure 4 if crank 2 rotates at 42 rad/s cw. Use instant centre method. [16]

   O_2A = 50, AB = 250, AC = 100, BC = 225, CD = 8 200.

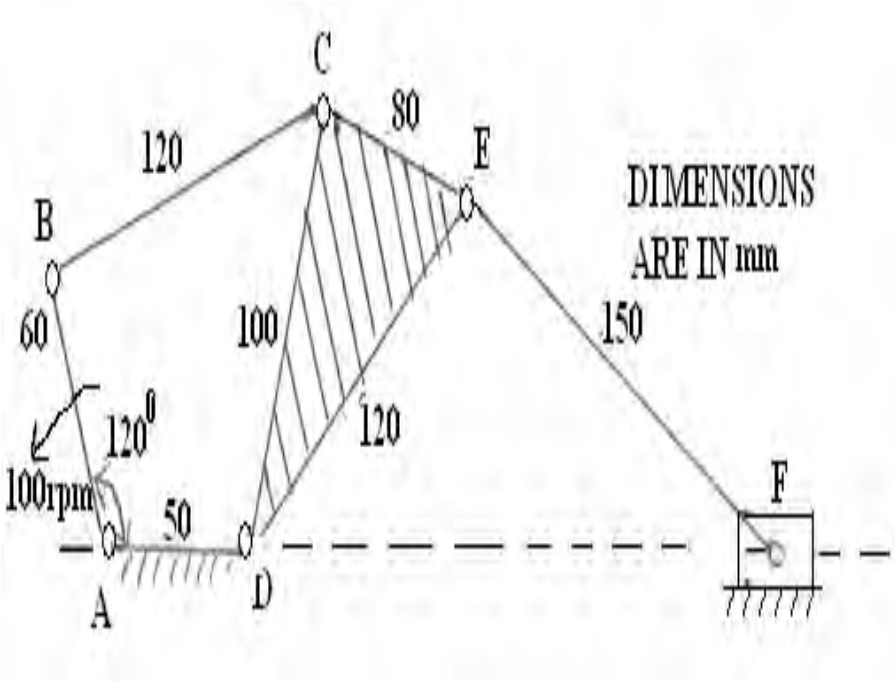

Figure 4

5. (a) What is a pantograph? Explain.

   (b) Two points P and Q, 40 mm apart are to be connected by a pantograph. The motion of P to the motion of Q is 13 : 7. Find the distancce of Q from the fixed point O of the pantograph such that the point P moves at least 127 mm in either direction of line OQP when it is horizontal. Find also the main dimension of the pantograph. [6+10]

6. (a) What is the difference between Double-helical and Herringbone gears?

   (b) Define the terms:

   i. Pitch circle
   ii. Pitch diameter
   iii. Pitch point
   iv. Circular pitch
   v. Module. [8+8]

7. A protective flange coupling is used to connect two shafts and transmit 7.5 kW power at 720 rpm. The design torque is 150% of the rated torque .The shafts and bolts are made of plain carbon steel 30C8 (S_{yt}= 400N/mm^2) and the made factor

of safety is 5. Assume,
S_{ye} =1.5S_{yt} and S_{sy} =0.5S_{yt}
The flanges are made of cast iron.
Calculate:

(a) diameter of the shafts;

(b) number of bolts; and

(c) diameter of the bolts. [16]

8. It is required to set out the profile of a cam to give the following motion to reciprocate the follower with a flat face.

(a) Follower to have a stroke of 30m.m. during the 120^0 rotation of the cam.

(b) Follower to dwell for 30^0 rotation of the cam.

(c) Follower to return to initial position during the120^0 of the earn rotation.

(d) Follower to dwell for the remaining 90^0 rotation of the cam.

The minimum radius of the earn is 25m.m. The motion of the follower is S.H.M. [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: 07A42104 **R07** **Set No. 1**

II B.Tech II Semester Examinations,APRIL 2011
MECHANISMS AND MECHANICAL DESIGN
Aeronautical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) What is the difference between Double-helical and Herringbone gears?
   (b) Define the terms:
      i. Pitch circle
      ii. Pitch diameter
      iii. Pitch point
      iv. Circular pitch
      v. Module. [8+8]

2. For a symmetrical tangent cam operating a roller follower, find:
   (a) The distance between cam centre and nose centre
   (b) Nose radius
   (c) Angle of contact of cam with straight flank
   (d) The acceleration of the follower at the beginning of the lift, where the roller just touches the nose and at the apex of the circular nose if the least radius of earn = 30 mm; roller radius = 17.5 mm; angle of ascent = 75^0 and total lift = 17.5 mm. The speed of the cam shaft is 300 r.p.m. Assume that there is no dwell between ascent and decent. [16]

3. It is required to set out the profile of a cam to give the following motion to reciprocate the follower with a flat face.
   (a) Follower to have a stroke of 30m.m. during the 120^0 rotation of the cam.
   (b) Follower to dwell for 30^0 rotation of the cam.
   (c) Follower to return to initial position during the120^0 of the camrotation.
   (d) Follower to dwell for the remaining 90^0 rotation of the cam.

   The minimum radius of the earn is 25m.m. The motion of the follower is S.H.M. [16]

4. Each road wheel of a motor cycle has a mass moment of inertial of 1.5 kg-m^2. The rotation parts of the engine of the motorcycle have a mass moment of inertial of 0.25 kg-m2. The speed of the engine is 5 times the speed of the wheels and is in the same sense. The mass of the motor cycle is traveling at 50 kmph and its center of gravity is 0.6 m above the ground level. Find the angle of heel if the cycle with its rider is 250 kg and is taking a turn of m radius. The wheel diameter is 0.6m. [16]

5. Find the velocities of points B, C, and D of the double-slider mechanism shown in the figure 5 if crank 2 rotates at 42 rad/s cw. Use instant centre method. [16]
   O_2A = 50, AB = 250, AC = 100, BC = 225, CD = 8 200.

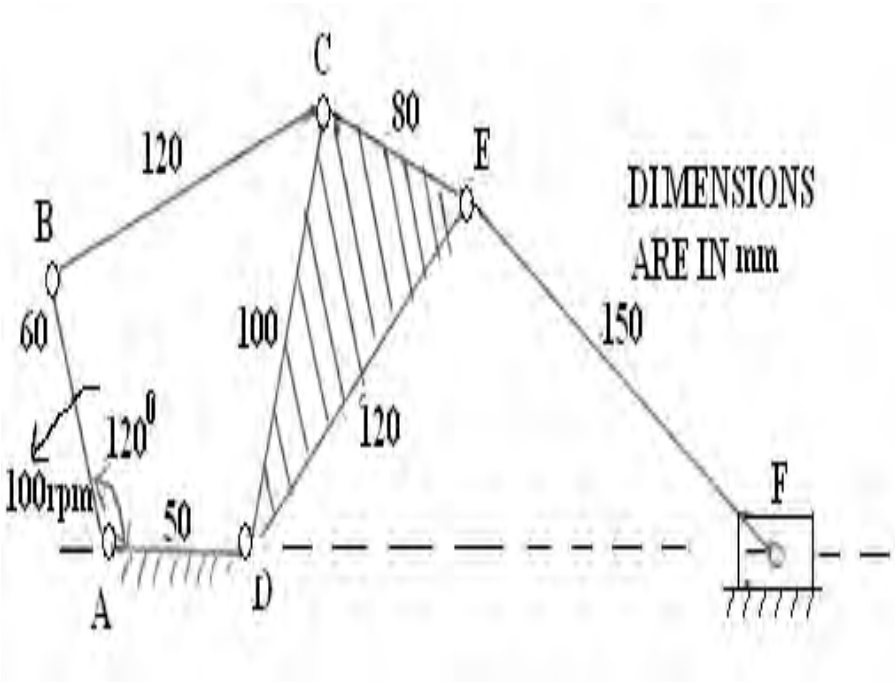

Figure 5

6. In the mechanism shown figure6 D is constrained to move on a horizontal path. Find, for the given configuration, the velocity and acceleration of D and the angular velocity and acceleration of BD when OC is rotating in a counter-clockwise direction at a speed of 180 r.p.m., increasing at the rate of 50 rad/s^2. [16]

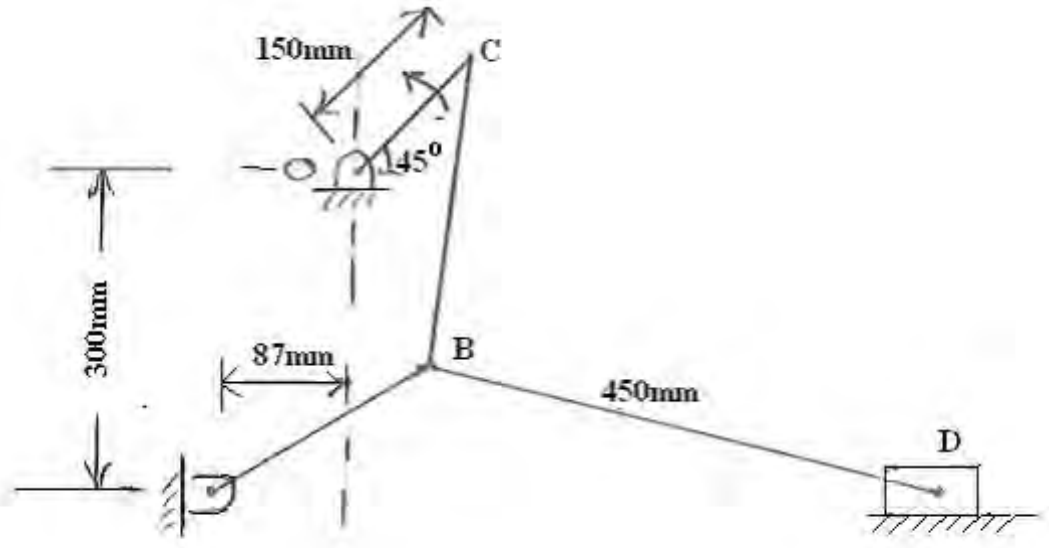

Figure 6

7. A protective flange coupling is used to connect two shafts and transmit 7.5 kW

power at 720 rpm. The design torque is 150% of the rated torque .The shafts and bolts are made of plain carbon steel 30C8 (S_{yt}= 400N/mm^2) and the made factor of safety is 5. Assume,
S_{ye} =1.5S_{yt} and S_{sy} =0.5S_{yt}
The flanges are made of cast iron.
Calculate:

(a) diameter of the shafts;

(b) number of bolts; and

(c) diameter of the bolts. [16]

8. (a) What is a pantograph? Explain.

(b) Two points P and Q, 40 mm apart are to be connected by a pantograph. The motion of P to the motion of Q is 13 : 7. Find the distancce of Q from the fixed point O of the pantograph such that the point P moves at least 127 mm in either direction of line OQP when it is horizontal. Find also the main dimension of the pantograph. [6+10]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: 07A42104 **R07** **Set No. 3**

II B.Tech II Semester Examinations,APRIL 2011
MECHANISMS AND MECHANICAL DESIGN
Aeronautical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. In the mechanism shown figure1 D is constrained to move on a horizontal path. Find, for the given configuration, the velocity and acceleration of D and the angular velocity and acceleration of BD when OC is rotating in a counter-clockwise direction at a speed of 180 r.p.m., increasing at the rate of 50 rad/s^2. [16]

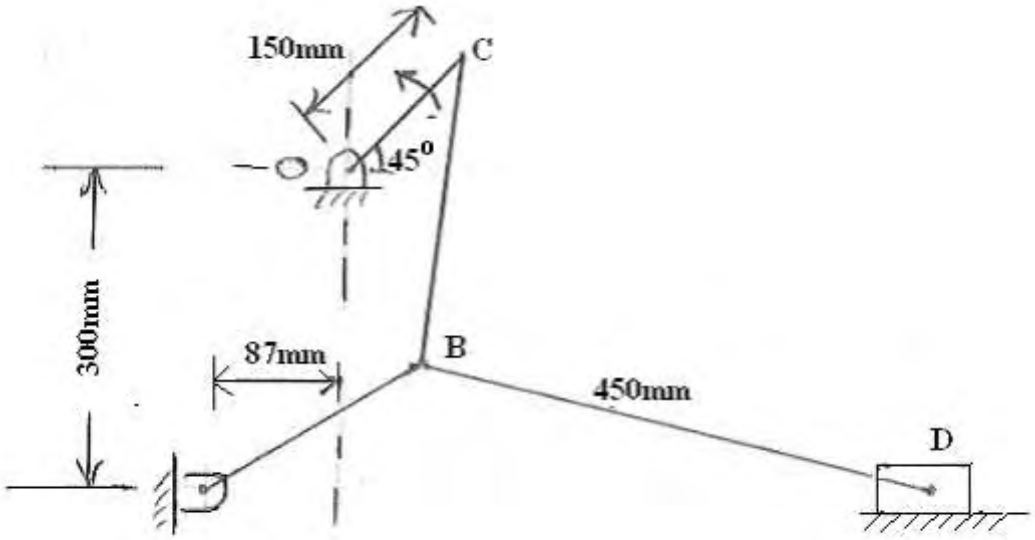

Figure 1

2. For a symmetrical tangent cam operating a roller follower, find:

   (a) The distance between cam centre and nose centre

   (b) Nose radius

   (c) Angle of contact of cam with straight flank

   (d) The acceleration of the follower at the beginning of the lift, where the roller just touches the nose and at the apex of the circular nose if the least radius of earn = 30 mm; roller radius = 17.5 mm; angle of ascent = 75^0 and total lift = 17.5 mm. The speed of the cam shaft is 300 r.p.m. Assume that there is no dwell between ascent and decent. [16]

3. (a) What is a pantograph? Explain.

   (b) Two points P and Q, 40 mm apart are to be connected by a pantograph. The motion of P to the motion of Q is 13 : 7. Find the distancce of Q from the

fixed point O of the pantograph such that the point P moves at least 127 mm in either direction of line OQP when it is horizontal. Find also the main dimension of the pantograph. [6+10]

4. Find the velocities of points B, C, and D of the double-slider mechanism shown in the figure 4 if crank 2 rotates at 42 rad/s cw. Use instant centre method. [16]

   O_2A = 50, AB = 250, AC = 100, BC = 225, CD = 8 200.

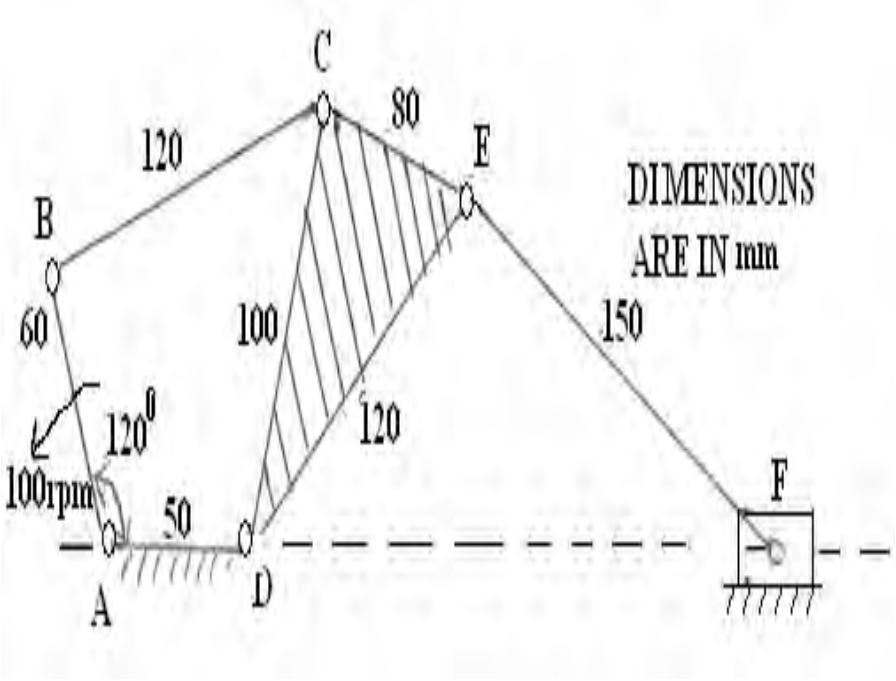

Figure 4

5. It is required to set out the profile of a cam to give the following motion to reciprocate the follower with a flat face.

   (a) Follower to have a stroke of 30m.m. during the 120^0 rotation of the cam.

   (b) Follower to dwell for 30^0 rotation of the cam.

   (c) Follower to return to initial position during the120^0 of the camrotation.

   (d) Follower to dwell for the remaining 90^0 rotation of the cam.

   The minimum radius of the earn is 25m.m. The motion of the follower is S.H.M. [16]

6. Each road wheel of a motor cycle has a mass moment of inertial of 1.5 kg-m^2. The rotation parts of the engine of the motorcycle have a mass moment of inertial of 0.25 kg-m2. The speed of the engine is 5 times the speed of the wheels and is in the same sense. The mass of the motor cycle is traveling at 50 kmph and its center of gravity is 0.6 m above the ground level. Find the angle of heel if the cycle with its rider is 250 kg and is taking a turn of m radius. The wheel diameter is 0.6m. [16]

7. (a) What is the difference between Double-helical and Herringbone gears?

(b) Define the terms:

i. Pitch circle
ii. Pitch diameter
iii. Pitch point
iv. Circular pitch
v. Module. [8+8]

8. A protective flange coupling is used to connect two shafts and transmit 7.5 kW power at 720 rpm. The design torque is 150% of the rated torque .The shafts and bolts are made of plain carbon steel 30C8 (S_{yt}= 400N/mm^2) and the made factor of safety is 5. Assume,
S_{ye} =1.5S_{yt} and S_{sy} =0.5S_{yt}
The flanges are made of cast iron.
Calculate:

(a) diameter of the shafts;

(b) number of bolts; and

(c) diameter of the bolts. [16]

⋆ ⋆ ⋆ ⋆ ⋆