**R07** 

Set No. 2

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

Time: 3 hours

Code No: 07A42104

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 =  $75^{\circ}$  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, Q, 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]

 $O_2 A = 50, AB =$  $100, BC = 225, CD = 8\ 200.$ 



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

## **R07**

## Set No. 2

[16]

bolts are made of plain carbon steel 30C8 (S<sub>yt</sub> = 400N/mm<sup>2</sup>) 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.
- 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 the  $120^{\circ}$  of the earn rotation.
  - (d) Follower to dwell for the remaining  $90^0$  rotation of the cam.

The minimum radius of the earn is 25 m.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 distance 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 figure 6D 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<sup>2</sup>. The rotation parts of the engine of the motorcycle have a mass moment of inertial of 0.25 kg-m<sub>2</sub>. 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]

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**R07** 

Set No. 4

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

Time: 3 hours

Code No: 07A42104

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<sup>2</sup>. The rotation parts of the engine of the motorcycle have a mass moment of inertial of 0.25 kg-m<sub>2</sub>. 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 figure 2D 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

Code No: 07A42104

 $\mathbf{R07}$ 

# Set No. 4

[8+8]

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]

 $O_2 A = 50$ , AB = 250, AC = 100, BC = 225, CD = 8200.



- 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 distance 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.
- 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 ( $S_{yt} = 400 \text{N/mm}^2$ ) and the made factor

 $\mathbf{R07}$ 

## Set No. 4

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.
- 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.

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- (c) Follower to return to initial position during the  $120^{\circ}$  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]

[16]

**R07** 

## Set No. 1

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

Time: 3 hours

Code No: 07A42104

Max Marks: 80

[8+8]

### 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.
- 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 =  $75^{\circ}$  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 the  $120^{\circ}$  of the camrotation.
  - (d) Follower to dwell for the remaining  $90^{\circ}$  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<sup>2</sup>. The rotation parts of the engine of the motorcycle have a mass moment of inertial of 0.25 kg-m<sub>2</sub>. 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 0.6 m.

[16]

### 7

 $\mathbf{R07}$ 

# Set No. 1

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<sub>2</sub>A = 50, AB = 250, AC = 100, BC = 225, CD = 8 200.





6. In the mechanism shown figure 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

## $\mathbf{R07}$

# Set No. 1

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<sub>yt</sub> = 400 N/mm<sup>2</sup>) 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.
- 8. (a) What is a pantograph? Explain.

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(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 distance 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]

[16]

**R07** 

Set No. 3

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

Time: 3 hours

Code No: 07A42104

Max Marks: 80

### Answer any FIVE Questions All Questions carry equal marks $\star \star \star \star \star$

1. In the mechanism shown figure 1D 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 distance of Q from the

## **R07**

# Set No. 3

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]

 $O_2 A = 50$ , AB = 250, AC = 100, BC = 225, CD = 8200.



- 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 the  $120^{0}$  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<sup>2</sup>. The rotation parts of the engine of the motorcycle have a mass moment of inertial of 0.25 kg-m<sub>2</sub>. 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?

## $\mathbf{R07}$

## Set No. 3

- (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 ( $S_{yt} = 400 \text{N/mm}^2$ ) and the made factor of safety is 5. Assume,

 $\mathbf{S}_{ye}$  =1.5 $\mathbf{S}_{yt}$  and  $\mathbf{S}_{sy}$  =0.5 $\mathbf{S}_{yt}$ \*\*\*\* The flanges are made of cast iron. Calculate:

- (a) diameter of the shafts;
- (b) number of bolts; and

(c) diameter of the bolts.

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[16]