STAPLE

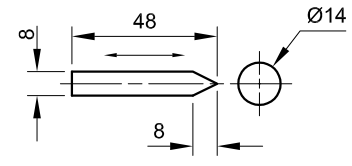
QUESTION 2: LOCI (CAM)

Given:
The detail of a wedge-shaped follower and the camshaft

Specifications:
- The follower reciprocates on the horizontal centre line of the camshaft
- The minimum distance from the follower to the centre of the camshaft = 14 mm
- Rotation = clockwise

Motion:
The cam imparts the following motion to the follower:
- It moves left with uniform acceleration and retardation for 40 mm over the first 180°
- It moves further left with uniform motion for 15 mm over the next 90°
- It moves right with simple harmonic motion back to the original position for the rest of the rotation.

Instructions:
- Draw, to scale 1 : 1, the given camshaft and the wedge-shaped follower at the minimum distance.
- Draw, to a rotational scale of 30° = 8 mm and a displacement scale of 1 : 1, the complete displacement graph for the required motion.
- Label the displacement graph and include the scale.
- Project and draw the cam profile from the displacement graph.
- Show the direction of rotation on the cam profile.
- Show ALL construction. **[40]**



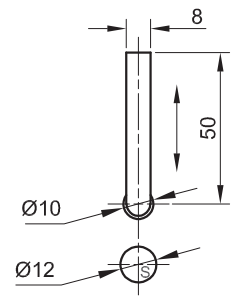
ASSESSMENT CRITERIA						
1	GIVEN + MINIMUM DISTANCE + CL	5				
2	GRAPH CONSTRUCTION	7				
3	PLOTTING POINTS + GRAPH CURVES	11				
4	CAM CONSTRUCTION	6				
5	PLOTTING OF CAM	7				
6	CAM PROFILE	4				
PENALTIES (-)						
	TOTAL	**40**				

EXAMINATION NUMBER

EXAMINATION NUMBER

STAPLE

S



QUESTION 2: LOCI (CAM)

Given:
- The detail of a roller-ended follower and the cam shaft
- The position of centre point S on the drawing sheet

Specifications:
- The follower reciprocates on the vertical centre line of the cam shaft
- The minimum distance from the follower to the centre of the cam shaft = 15 mm
- Roller = Ø10 mm
- Rotation = anti-clockwise

Motion:
The cam imparts the following motion to the follower:
- It rises with uniform motion for 25 mm over the first 45°
- There is a dwell period for the next 30°
- It rises with uniform motion for 24 mm over the next 30°
- It rises with uniform motion a further 7 mm over the next 45°
- There is a dwell period for the next 30°
- It descends with simple harmonic motion to the original position over the rest of the rotation.

Instructions:
- Draw, to scale 1 : 1, the given camshaft and the roller-ended follower at the minimum distance.
- Draw, in the correct position and to a rotational (horizontal) scale of 30° = 8 mm and a displacement scale of 1 : 1, the complete displacement graph for the required motion.
- Label the displacement graph and include the scale.
- Project and draw the cam profile from the displacement graph.
- Show the direction of rotation on the cam profile.
- Show ALL construction and projection. **[38]**

ASSESSMENT CRITERIA						
1	GIVEN + MINIMUM DISTANCE + CL	5				
2	GRAPH CONSTRUCTION	7				
3	PLOTTING POINTS + CURVE	8				
4	CAM CONSTRUCTION	5				
5	PLOTTING	7				
6	CAM PROFILE	6				
	TOTAL	**38**				

EXAMINATION NUMBER	
EXAMINATION NUMBER	3

STAPLE

S

QUESTION 2: LOCI

CAM

Given:

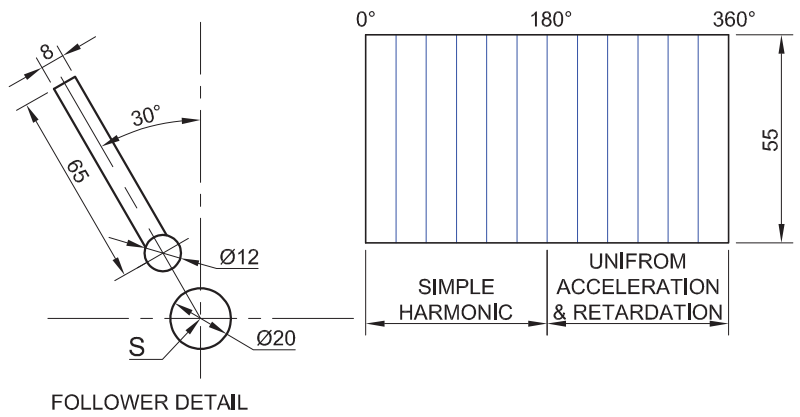
- The detail of a roller-ended follower and the cam shaft
- The incomplete displacement graph
- The position of point S on the answer sheet

Specifications:

- The minimum distance from the cam profile to the centre of the camshaft = 19 mm
- The follower reciprocates along the 30° centre line which passes through the centre of the camshaft
- Rotation = clockwise

Instructions:

- Draw, to scale 1 : 1, the given follower and camshaft.
- Draw, to a horizontal scale of 8 mm equal to 30° and a displacement scale of 1 : 1, the complete displacement graph for the required motions. Label the graph.
- Project and draw the cam profile from the displacement graph.
- Show the direction of rotation on the cam profile.
- Show ALL necessary construction and projection. **[40]**



FOLLOWER DETAIL

ASSESSMENT CRITERIA						
1	PLACEMENT, GRAPH DIVISIONS + CONSTRUCTION FOR MOVEMENT + LABEL	$7\frac{1}{2}$				
2	PLOTTING POINTS & CURVE	$10\frac{1}{2}$				
3	FOLLOWER + MIN. DIST' C'LINES+ CAMSHAFT+ DIRECTION	9				
4	CONSTRUCTION	3				
5	PLOTTING	6				
6	PROFIEL	4				
TOTAL		**40**				
EXAMINATION NUMBER						
EXAMINATION NUMBER						3

STAPLE

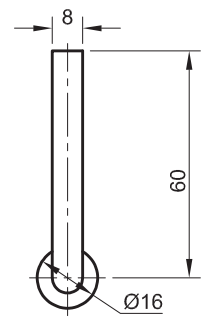
QUESTION 2: LOCI

Given:
The detail of the roller-ended follower for a disc cam.

Specifications:
- The minimum distance from the centre of the cam shaft to the cam profile = 20 mm
- Camshaft = Ø 20 mm
- Rotation = clockwise

Motion:
The disc cam rotates at constant velocity imparting the following uniform motion to the roller-ended follower:
- Over the first 60° the follower is at rest.
- Over the next 60° the follower rises to a height of 57 mm.
- There is a dwell period for the next 45°.
- Over the next 45° the follower falls 20 mm.
- There is a dwell period for the next 60°.
- Over the final 90° the follower returns to its original position.

Instructions:
- Using a horizontal scale of 30° equal to 8 mm and a displacement scale of 1 : 1, draw the displacement graph for the given motion.
- Label the displacement graph and include the scale.
- Draw, to scale 1 : 1, the given roller-ended follower in the correct position.
- Project and draw the cam profile from the displacement graph.
- Show the direction of rotation on the cam profile.
- Show ALL necessary construction. **[36]**



ASSESSMENT CRITERIA						
1	DISPLACEMENT GRAPH	10				
2	FOLLOWER, ARROW, SHAFT + CENTRE LINES + MIN DIST. + ROTATION	9				
3	CONSTRUCTION	4				
4	ROLLER + PROFILE	13				
TOTAL		**36**				

EXAMINATION NUMBER

EXAMINATION NUMBER 3

STAPLE

QUESTION 2: LOCI (CAM)

Given:

- The shaft and follower detail of an industrial cam with the follower shown at its furthest position to the left
- The vertical centre line of the camshaft as a reference on the drawing sheet

The specifications for the movement are as follows:

- The cam rotates clockwise at constant velocity and imparts uniform motion to the follower.
- Over the first 60° the follower moves 20 mm to the right.
- There is a dwell period for the next 30°.
- Over the next 30° the follower moves a further 20 mm to the right.
- Over the next 60° the follower moves a further 20 mm to the right.
- There is a dwell period for the next 45°.
- Over the next 45° the follower moves 50% of the displacement to the left.
- There is a dwell period for the next 30°.
- Over the final 60° the follower returns to its original position.

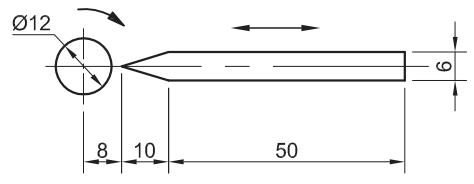
Instructions:

2.1 Draw, to scale 1 : 1, the given view of the camshaft and the follower using the given vertical centre line as reference. The arrow indicating the direction of rotation must be shown.

2.2 Draw the displacement graph with a rotational scale of 30° equal to 8 mm and a displacement scale of 1 : 1 for the given motion. Label the graph.

2.3 Project and draw the cam profile that would generate the given motion.

- Show ALL necessary construction. **[33]**



CAMSHAFT AND FOLLOWER DETAIL

ASSESSMENT CRITERIA				
1. GRAPH	11			
2. FOLLOWER + SHAFT + ARROW	5			
3. CONSTRUCTION	4			
4. CAM POINTS	7			
5. CURVE + QUALITY	6			
TOTAL	**33**			

EXAMINATION NUMBER

EXAMINATION NUMBER 3

STAPLE

QUESTION 2: LOCI (CAM)

A toy manufacturing company wishes to design a toy car that when it is pushed along the ground, the body of the car rises and falls. This can be achieved by attaching a cam to the inside of the wheel with a roller-follower attached to the body of the car.

The specifications for the movement are as follows:

- The car rises with uniform motion to a height of 23mm over the first 90°
- There is a dwell period for the next 60°
- It then rises a further 37mm over the next 75°
- There is another dwell period for the next 60°
- The car returns to its original position over the final 75°

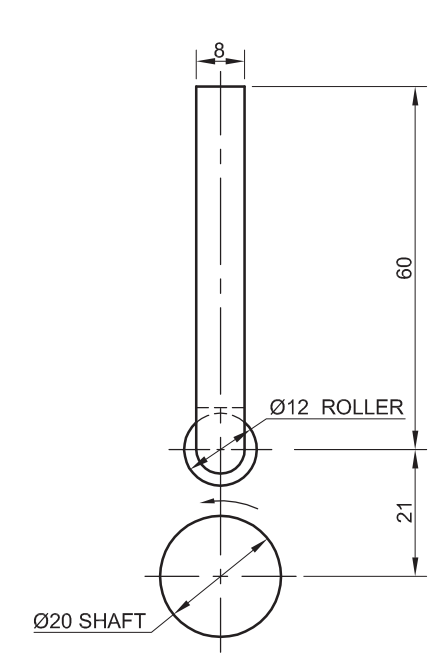
Given:

The cam shaft and the follower detail in its lowest position. The cam rotates in an anti-clockwise direction as shown by the arrow.

Instruction:

- Copy the camshaft and follower detail. Show the arrow indicating the direction of rotation.
- Draw a displacement graph with a horizontal scale of 30° equal to 8mm and a vertical scale of 1:1 for the given motion. Label the graph and include a scale.
- Project and draw the cam profile that would generate the given motion.

[36]



CAMSHAFT AND FOLLOWER DETAIL

ASSESSMENT CRITERIA

GRAPH	9
GIVEN INFO: FOLLOWER, MIN HEIGHT DIRECTION ARROW SHAFT and CL,s	11
CONSTRUCTION	4
ROLLER POSITIONS + CURVE QUALITY	12
TOTAL	**36**

EXAMINATION NUMBER

EXAMINATION NUMBER 3