

LABASA SANGAM (SKM) COLLEGE
TECHNICAL DRAWING
WORKSHEETS
YEAR 13

QUESTION 1

(15 marks)

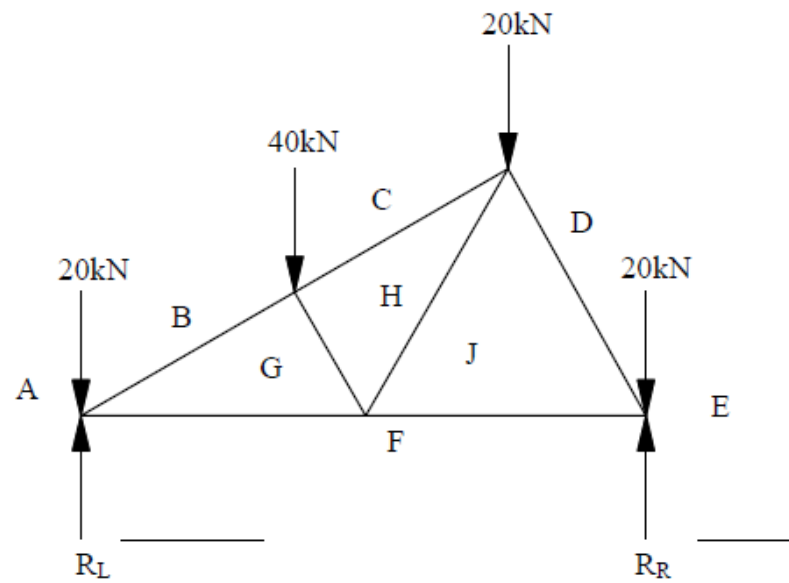
Part A

[8 marks]

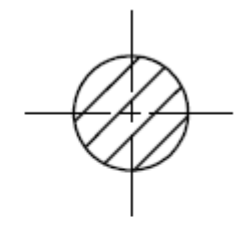
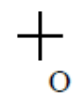
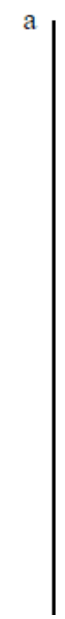
Given: The diagram below shows a roof truss with vertical loads acting on the nodes. The truss is supported at each end by R_L and R_R .

Required:

- i. Draw the polar diagram on the load line and polar point 'O'. (1 mark)
- ii. Draw the link polygon. (2 marks)
- iii. Determine the magnitude of reactions R_L and R_R . (2 marks)
- iv. Draw the vector diagram node ABGF only. (2 marks)
- v. Complete the given table showing the nature and magnitude of the force in members BG and FG. (1 mark)



LOAD LINE
SCALE 1mm : 1kN



Part B

[7 marks]

Given: The section of a circular spring having a diameter of 14 mm, pitch of 60 mm and its axis.

Required: construct the true helical form of a right-hand spring for 1/4 revolutions.

(7 marks)

| VECTOR FORCES | | |
|---------------|----------------|--------|
| Member | Magnitude (kN) | Nature |
| BG | | |
| FG | | |

| | | |
|-----------|-----|--|
| Line type | 1/2 | |
| Accuracy | 1/2 | |
| Accuracy | 1/2 | |
| Line work | 1/2 | |
| Method | 1 | |
| Value | 1 | |
| Accuracy | 1 | |
| Method | 1 | |
| Position | 1 | |
| Value | 1/2 | |
| Accuracy | 1/2 | |

| | | |
|------------|-----|--|
| Method | 1 | |
| Cons lines | 1 | |
| Accuracy | 1 | |
| Shape | 1 | |
| Outline | 1/2 | |
| Position | 1/2 | |
| Size | 1 | |
| Neatness | 1 | |



QUESTION 2

(15 marks)

Part A

[7 marks]

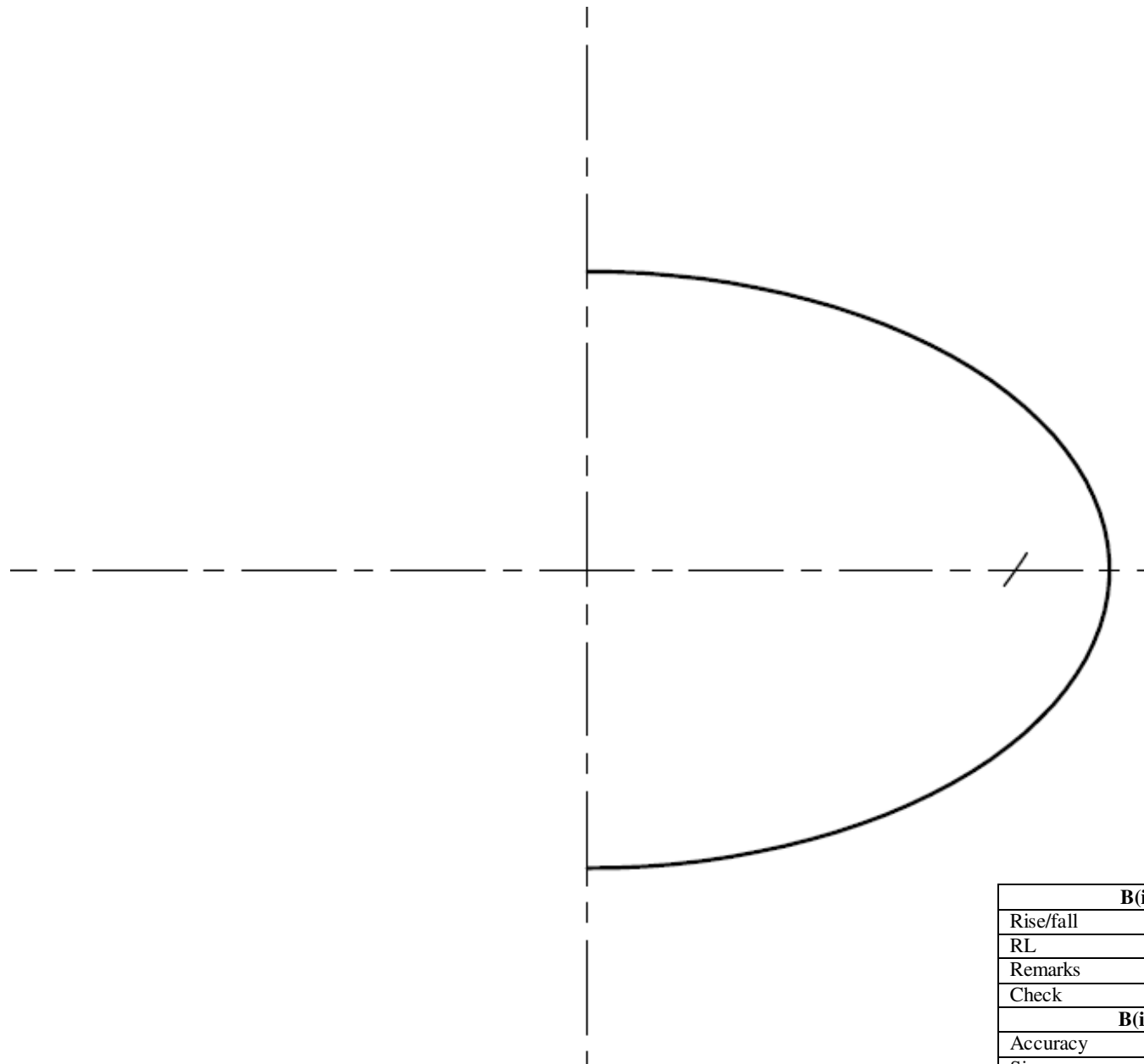
Given: A semi – ellipse has been drawn full size

Required:

Draw its evolute, showing all construction details

(7 marks)

| | | |
|-------------|---|--|
| Method | 1 | |
| Cons lines | 1 | |
| Line weight | 1 | |
| Neatness | ½ | |
| Accuracy | 1 | |
| Shape | 1 | |
| Size | 1 | |
| Position | ½ | |



| B(i) | | |
|-----------|---|--|
| Rise/fall | 1 | |
| RL | 1 | |
| Remarks | 1 | |
| Check | 1 | |
| B(ii) | | |
| Accuracy | 1 | |
| Size | 1 | |
| Method | 1 | |
| Shape | 1 | |

Part B

[8 marks]

A Surveyor’s incomplete Field book of readings taken at a new housing sub

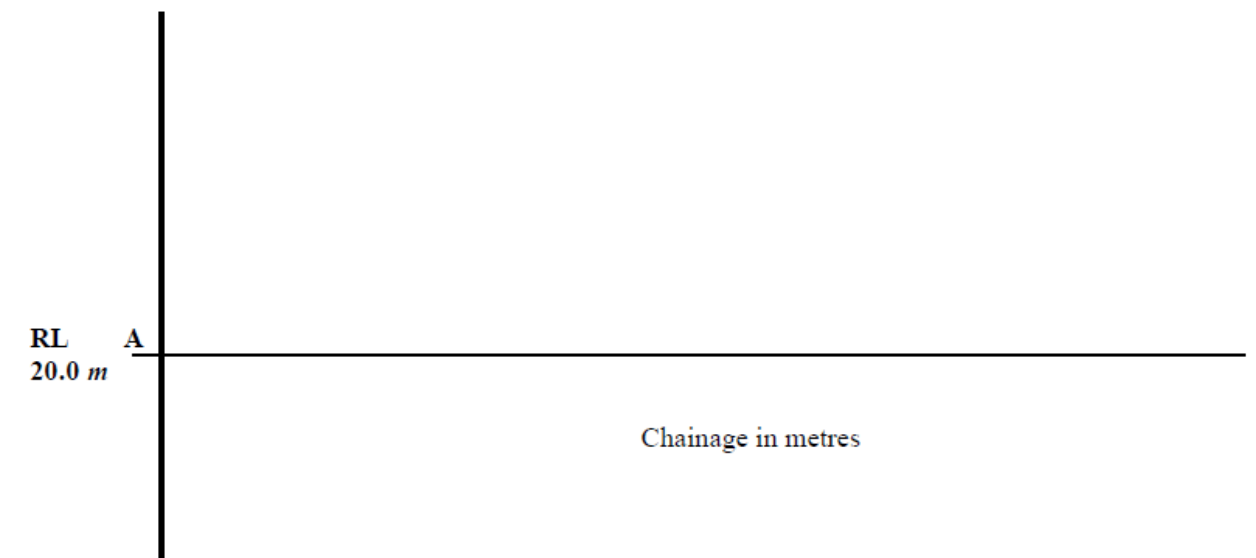
Required

- i. Complete the Level Book and check the booking. **(4 marks)**
- ii. Draw the cross section of the surveyed field on the given profile using the given scales. **(4 marks)**

Verticle scale = 1:100

Horizontal scale = 1:1000

| Back sight | Inter sight | Fore sight | Fise | Fall | Reduced level (m) | Distance (meters) | remarks |
|------------|-------------|------------|------|------|-------------------|-------------------|-----------|
| 1.8 | | | | | 20 m | 0.00 m | Station A |
| | 1.0 | | | | | 35 m | |
| 2.0 | | 3.8 | | | | 86 m | |
| 2.4 | | 3.0 | | | | 107 m | |
| | 1.5 | | | | | 132 m | |
| | | 0.7 | | | | 160 m | |
| | | | | | | | |



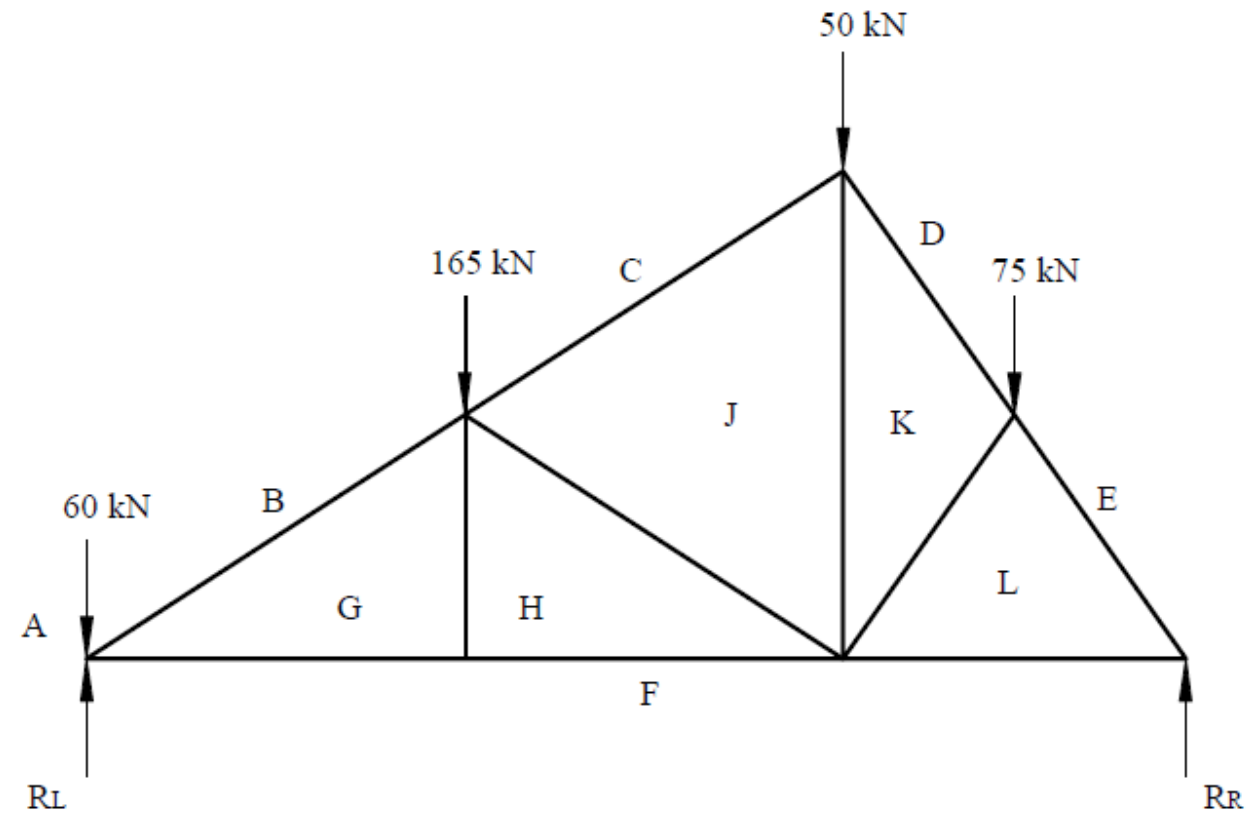
QUESTION 3

[10 marks]

Given: The diagram shows a roof truss with vertical loads acting on the nodes. The truss is supported at each end by R_L and R_R .

Using the diagram:

- i. Draw the polar diagram on the given load line. (5 marks)
- ii. Determine the magnitude of R_L and R_R .
 R_L _____ (1 mark)
 R_R _____ (1 mark)
- iii. Determine the position of the equilibrant. (1 mark)
- iv. Complete the given table showing the nature and magnitude of the force in each member. (2 marks)



LOAD LINE

Scale 1mm : 5 kN

a



+ o

| Member | BG | CJ | GH | FG |
|----------------|----|----|----|----|
| Magnitude (kN) | | | | |
| Nature (C/T) | | | | |

| | | |
|---------------|---|--|
| Method | 1 | |
| Cons lines | 1 | |
| Accuracy | 1 | |
| Shape | 1 | |
| Position | 1 | |
| R_L | 1 | |
| R_R | 1 | |
| Equilibrant | 1 | |
| A (iv) | | |
| Magnitude | 1 | |
| Nature | 1 | |

QUESTION 4

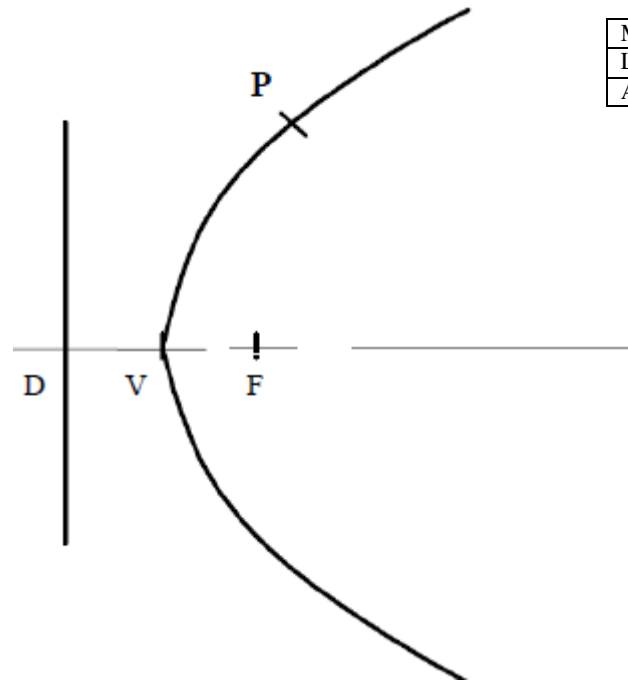
(15 marks)

Part A

[2 marks]

Given: A parabolic curve and Point **P** which lies on the curve

Required: Find the center of curvature for point **P**. **(2 marks)**



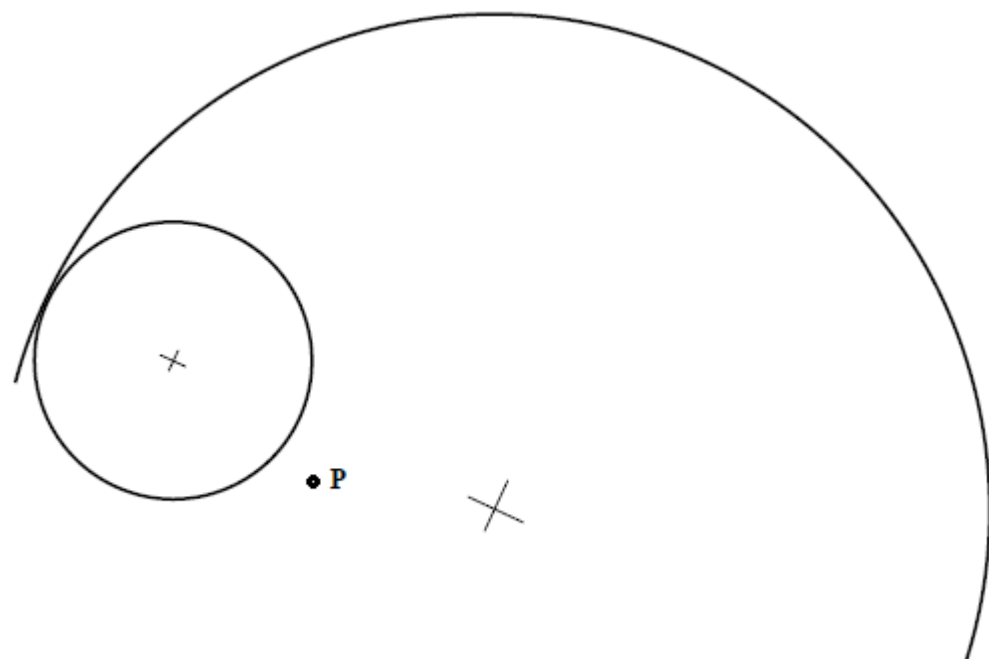
| | | |
|-----------|-----|--|
| Method | 1 | |
| Line work | 1/2 | |
| Accuracy | 1/2 | |

Part B

[6 marks]

Given: A rolling circle moving along a curved path in an anti-clockwise direction.

Required: Draw the locus of point **P** outside the rolling circle for 1/2 revolution. **(6 marks)**



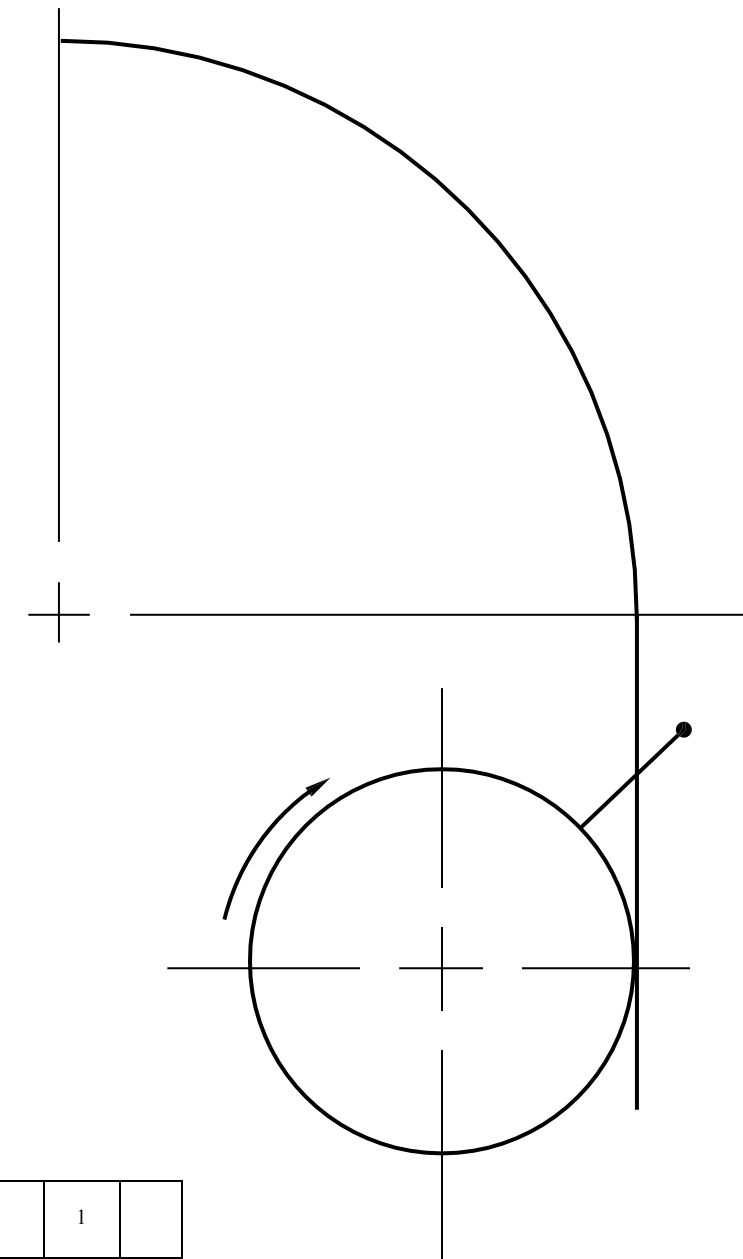
| | | |
|------------|---|--|
| Accuracy | 1 | |
| Shape | 1 | |
| Line work | 1 | |
| Method | 1 | |
| Neatness | 1 | |
| Cons lines | 1 | |

Part C

(7 marks)

Given: A rolling wheel **W**, point **P** outside the rolling wheel, rotating direction **R** and combination of flat and circular base **K**.

Required: Draw the locus of point **P** as the rolling wheel rolls for 1/2 revolution



| | | | |
|---|--|---|--|
| 1 | Correct divisions on rolling circle and labels shown | 1 | |
| 2 | Accuracy – path divisions, 1/2 rev, direction | 1 | |
| 3 | Correct generating lines or method | 1 | |
| 4 | Correct shape of locus | 2 | |
| 5 | Correct line work | 1 | |
| 6 | Neatness | 1 | |



QUESTION 5

(15 marks)

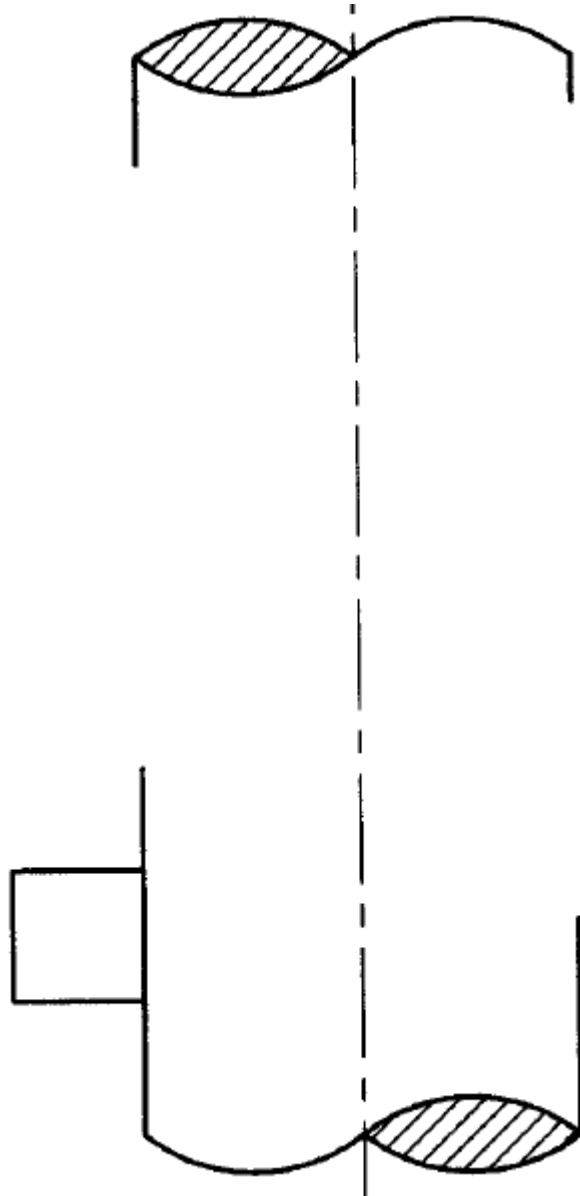
Part A

[10 marks]

Given: The incomplete elevation of a single start, left-hand **SQUARE THREAD** is given below.

Required:

- i. Draw 1 1/2 turns of the required thread which has a pitch of 55 mm.
Do not show hidden details



| | | |
|-------------|---|--|
| Method | 1 | |
| Cons lines | 1 | |
| Line weight | 1 | |
| Line type | 1 | |
| Neatness | 1 | |
| Accuracy | 1 | |
| Shape | 1 | |
| Size | 1 | |
| Position | 1 | |
| Outline | 1 | |

Part B

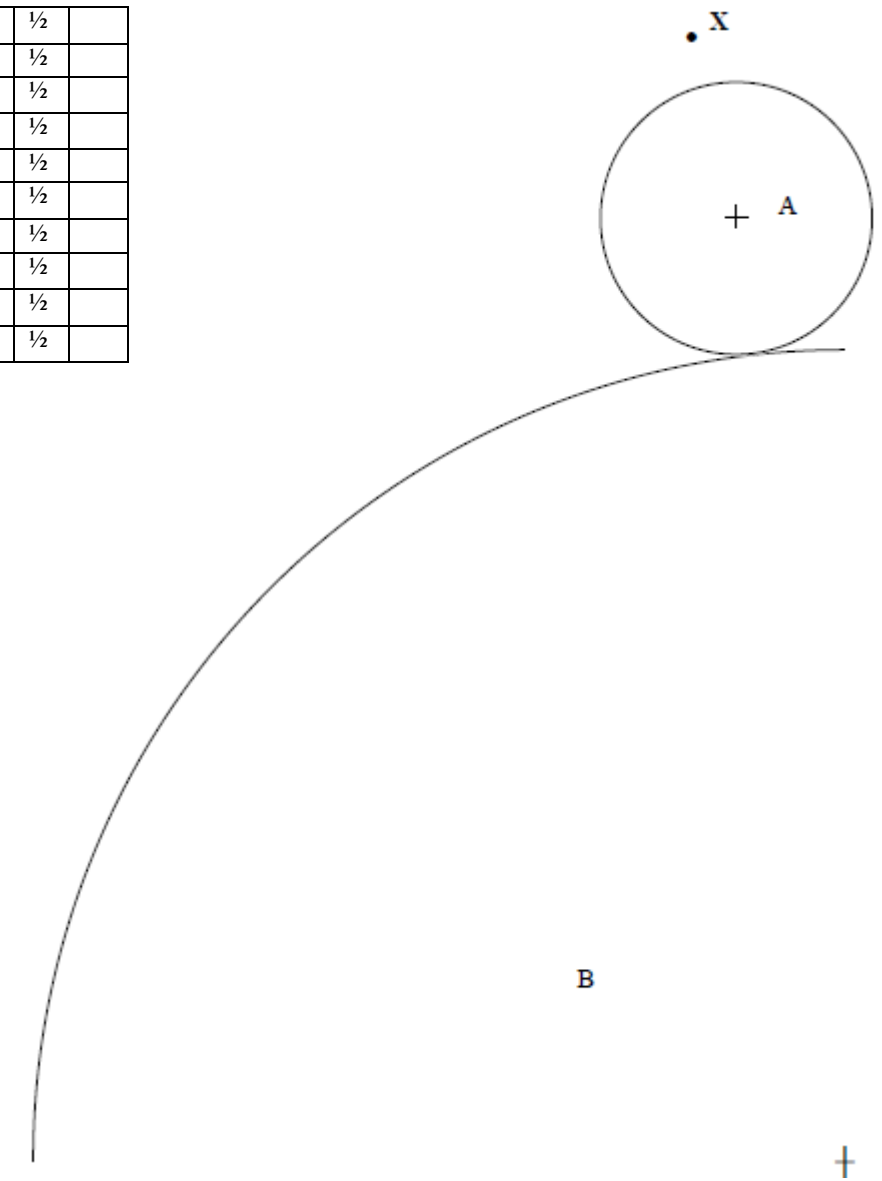
[5 marks]

Draw the locus of point **X** outside the given rolling circle **A** which rolls outside the base circle **B** without sliding for 1/2 revolution.

Name the curve produced: _____

(5 marks)

| | | |
|-------------|-----|--|
| Method | 1/2 | |
| Cons lines | 1/2 | |
| Line type | 1/2 | |
| Line weight | 1/2 | |
| Neatness | 1/2 | |
| Accuracy | 1/2 | |
| Shape | 1/2 | |
| Position | 1/2 | |
| Size | 1/2 | |
| Outline | 1/2 | |



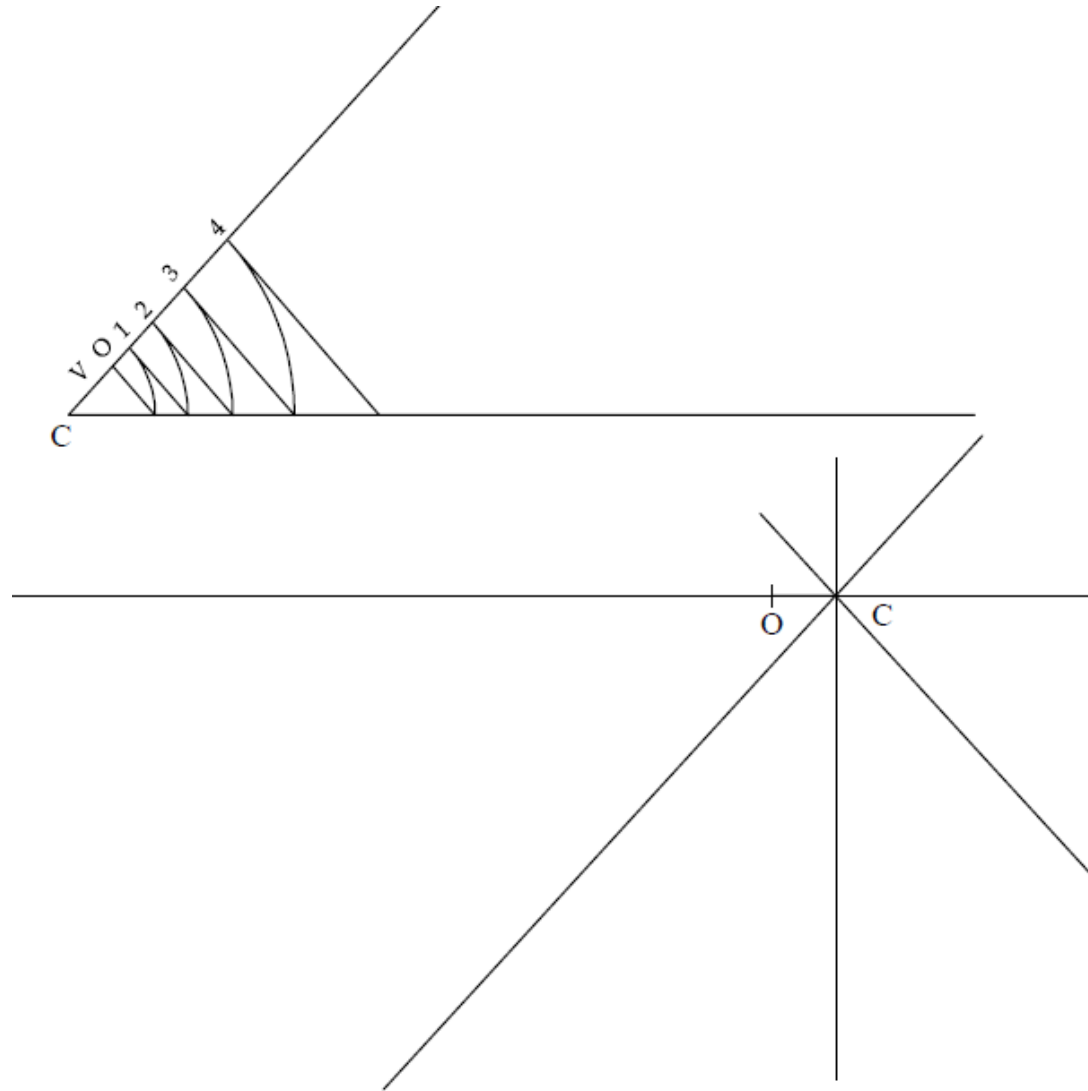
QUESTION 6

(10 marks)

(a) **GIVEN:** The angle between the vectors (45°), the length of the first vector (CO) and the vector ratio of 5:4 of a logarithmic spiral.

REQUIRED: (i) Complete the logarithmic progression. **(2 marks)**

(ii) Draw the logarithmic spiral on the given radials in a clockwise direction for 1 revolution. **(2 marks)**

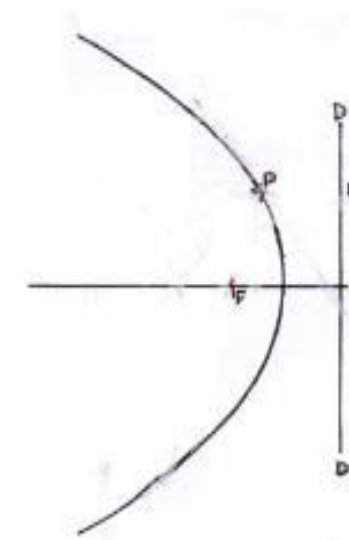


| Q6(a)(i) | | |
|----------|-----------------------------|---|
| 1 | Correct scaled drawn | 1 |
| 2 | Correct rotation/angle sued | 1 |
| Q6 (ii) | | |
| 6 | Correct sense | ½ |
| 7 | Correct rotation | ½ |
| 8 | Correct line work | ½ |
| 9 | neatness | ½ |

(C). **GIVEN:** The parabola with directrix, vertex and focal point and point P on the curve. **(2marks)**

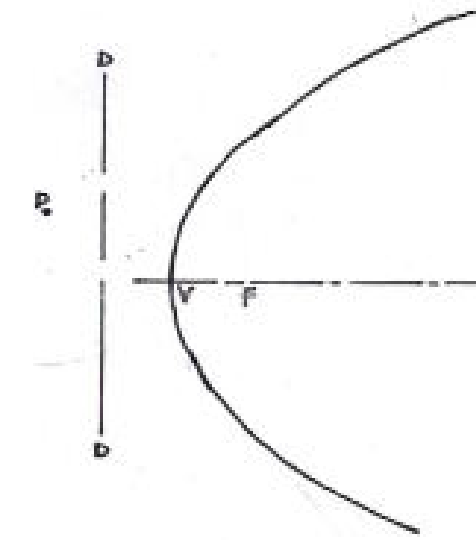
REQUIRED: Find the centre of curvature for a point P on the Parabola..

| Q 6(c) | | |
|--------|---------------------|---|
| 1 | Normal | ½ |
| 2 | tangent | ½ |
| 3 | Centre of curvature | 1 |



(D). **GIVEN:** The parabola with directrix, vertex and focal point and point P outside the curve. **(2marks)**

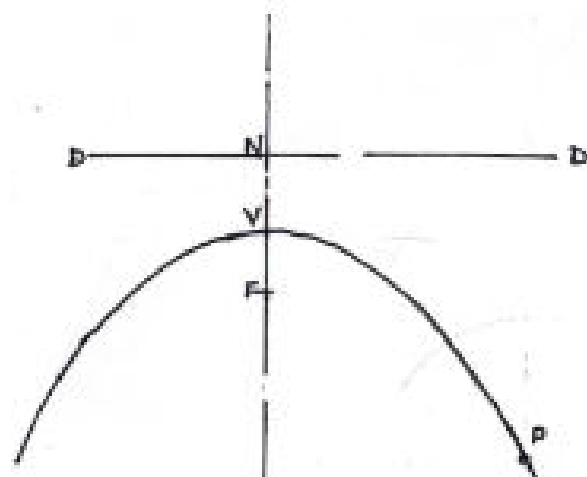
REQUIRED: Draw tangent from point P to the Parabola



| Q 6(d) | | |
|--------|---------------------|---|
| 1 | Normal | ½ |
| 2 | tangent | ½ |
| 3 | Correct method used | 1 |

(b). **GIVEN:** The parabola with directrix, vertex and focal point and point P on the curve. **(2marks)**

REQUIRED: Draw the tangent at point P.



| Q 6(b) | | |
|--------|---------------------|---|
| 1 | Normal | ½ |
| 2 | tangent | ½ |
| 3 | Correct method used | 1 |

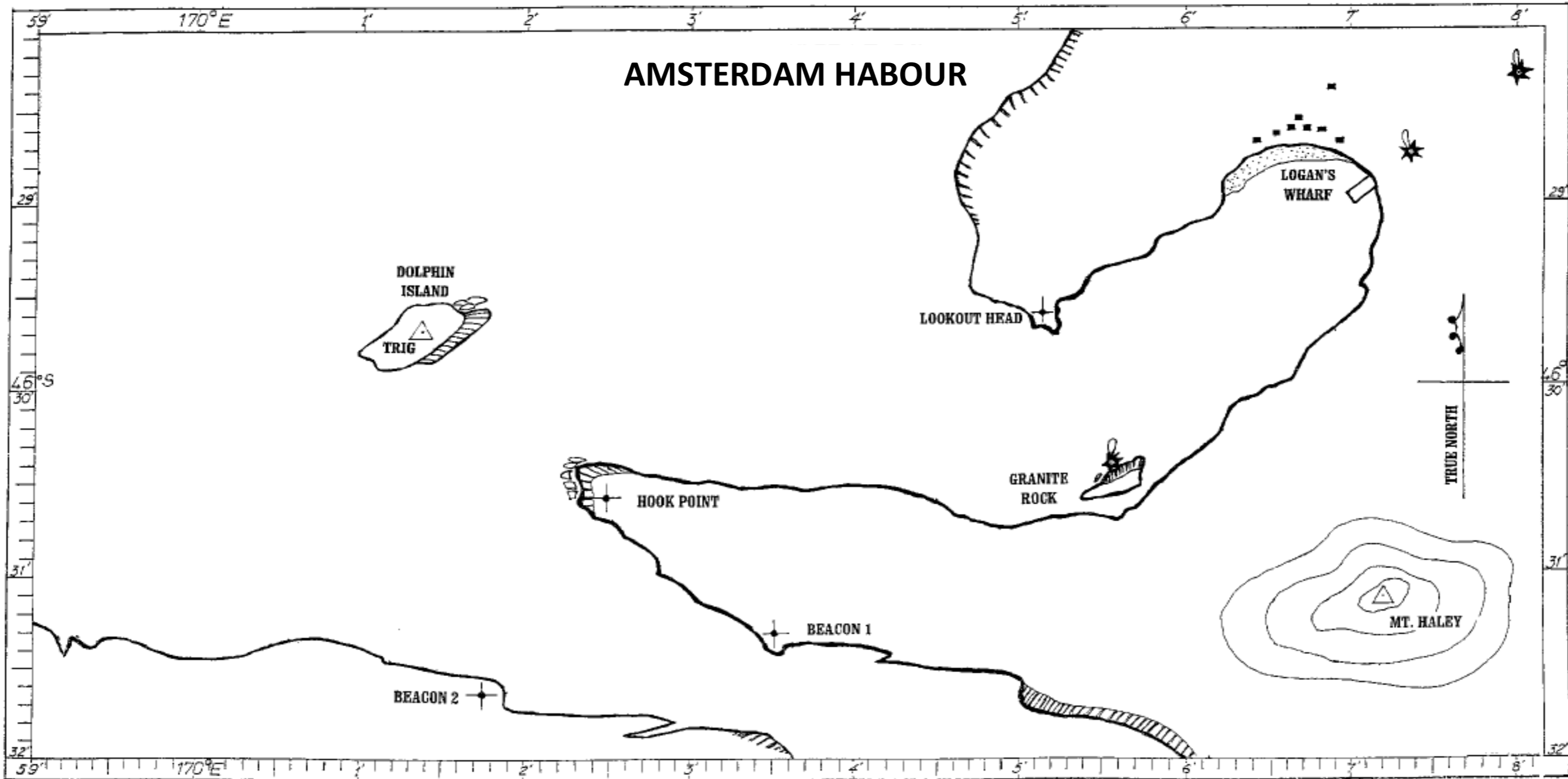


QUESTION 7**(15 marks)**

Plot the following course on the given chart.

1. The ship **Furious 1** enters **Amsterdam Harbour** on a course of **290°** which will pass through **Latitude 46°31.8'S Longitude 170°4'E**.
2. To determine its position, a **Running Fix** is taken.
 - a) **Beacon 2** bears **270°**
 - b) After sailing at 8 knots for 15 minutes, a second bearing on **Beacon 2** bears 180° - MARK FIX
3. From the Fix, sail to **Latitude 46°30.2'S Longitude 170°0.6'E**.
4. She alters course **Due East (090°)** until **Dolphin Island Trig** and **Hook Point** are in transit.
5. She again alters course to clear **Dolphin Island** by **0.6 n miles**.
6. (a) When directly abeam of **Dolphin Island**, turns to starboard (right) on a radius of **0.8 n miles**.
 - (b) Keep turning on the radius of 0.8 n miles until heading on a bearing of **125°**.
7. The **Furious 1** continues on this course until in transit with **Logan Wharf Lights**, where she steers directly to the wharf.

| Q7 | | | | |
|----|-------|----------------------------|-----|--|
| 1 | LEG 1 | Establish position/bearing | 1 ½ | |
| 2 | LEG 2 | Running fix | 1 | |
| | | Distance | 1 | |
| 3 | LEG 3 | Mark fix | 1 | |
| | | Longitude & Latitude | 2 | |
| 4 | LEG 4 | transit | ½ | |
| | | Due east | ½ | |
| 5 | LEG 5 | Clearance | 1 | |
| 6 | LEG 6 | Abeam | 1 | |
| | | Starboard | 1 | |
| | | Radius/bearing | 2 | |
| 7 | LEG 7 | Transit | 1 | |
| | | steers | 1 | |
| 8 | | Neatness/accuracy | ½ | |



QUESTION 8 DESIGN

(20 marks)

Problem: Most of the schools do not have a proper bus shelter for students near the bus bay when they wait for the bus in either a rainy or sunny weather. During rainy weather, students get wet and are vulnerable to many sicknesses and this may be a reason for the high rate of absenteeism during the wet weather.

Brief: Design a bus shelter that is capable of withstanding any weather condition. It should have benches on the sides to cater for at least 15 people at a time.

(c) Explain with the help of sketches how the bench is assembled to the main bus shelter. **(3 marks)**

(d) Draw a pencil-rendered or a colour-rendered pictorial sketch of the complete bus shelter with the emphasis on proportion, functionality and aesthetics. **(5 marks)**

Specification: The bus shelter should:

1. be affordable;
2. be aesthetically appealing;
3. be made from two or more locally available materials;
4. have natural and unprocessed materials for the roof and;
5. have the benches fixed to the shelter.

Requirements:

(a) Produce **two** freehand pictorial sketches of the bus shelter. **(8 marks)**

(b) Evaluate each sketch on the following basis:

(i) Materials

(ii) Strength **(4 marks)**

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|-----------------------------|--|---|-------------------------|---|-------------------------|---|--|---|-------------------|---|--|---|--------------------|---|--|---|---|---|---|--|---|----------------|---|--|---|--|---|--|--|--|--|--|
| <p>(a) Possible Solution 1 (4 marks)</p> | <p>Possible Solution 2 (4 marks)</p> | <p>(c) (3 marks)</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:5%; text-align: center;">1</td> <td style="width:15%;">Pictorial Crate/Box used</td> <td style="width:5%; text-align: center;">1</td> <td style="width:5%;"></td> <td style="width:5%; text-align: center;">3</td> <td style="width:15%;">Correct labels</td> <td style="width:5%; text-align: center;">1</td> <td style="width:5%;"></td> </tr> <tr> <td style="text-align: center;">2</td> <td>Correct line work</td> <td style="text-align: center;">1</td> <td></td> <td style="text-align: center;">4</td> <td>Correct proportion</td> <td style="text-align: center;">1</td> <td></td> </tr> </table> | | 1 | Pictorial Crate/Box used | 1 | | 3 | Correct labels | 1 | | 2 | Correct line work | 1 | | 4 | Correct proportion | 1 | | <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:5%; text-align: center;">1</td> <td style="width:15%;">Overall neatness and clarity of sketch (es)</td> <td style="width:5%; text-align: center;">1</td> <td style="width:5%;"></td> <td style="width:5%; text-align: center;">3</td> <td style="width:15%;">Evidence shown</td> <td style="width:5%; text-align: center;">1</td> <td style="width:5%;"></td> </tr> <tr> <td style="text-align: center;">2</td> <td>Relevant explanations and labels given</td> <td style="text-align: center;">1</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table> | 1 | Overall neatness and clarity of sketch (es) | 1 | | 3 | Evidence shown | 1 | | 2 | Relevant explanations and labels given | 1 | | | | | |
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| 2 | Correct line work | 1 | | 4 | Correct proportion | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Overall neatness and clarity of sketch (es) | 1 | | 3 | Evidence shown | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Relevant explanations and labels given | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>(b) Criteria Possible Solution 1 (2 marks) Possible Solution 2 (2 marks)</p> | | <p>(d) (5 marks)</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>(i) Materials</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>(ii) Strength</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 2 | Correct labels | 1 | | 4 | Correct proportion | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Correct line work | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

