Index Number:

RATU NAVULA COLLEGE

YEAR 12 TRIAL EXAMINATION 2020

TECHNICAL DRAWING

Time allowed: 3 hours
(An extra 10 minutes is allowed for reading this paper)

Mark Gained:

INSTRUCTIONS

1. Write your **Index Number** in the box provided on each sheet of this **Question and Answer Booklet**.
2. Write **all** your answers in the spaces provided for each question in this **Question and Answer Booklet.**
3. Do all your work in pencil. Do not use ink.
4. Write neatly and clearly. Show all construction lines lightly but clearly.
5. **All measurements are in millimeters** unless stated otherwise.
6. Show all calculations on the paper.
7. At the end of the examination, ensure **all** loose sheets are tied inside this **Question and Answer Booklet** at the appropriate places, including **SHEET 1** in numerical order.
8. You may use a calculator, provided it is silent, battery-operated and non-programmable.
9. There are **three** sections in this paper. Sections A and B are **compulsory**. **Note the options** in **Section C**.
10. Put a tick (✓) alongside each of the five questions you have answered in **Section B** and the question you have answered in **Section C**, on the table provided on the right.

Note: Do not fold the sheets.

SUMMARY OF QUESTIONS

SECTION	GUIDELINES	MARK	SUGGESTED TIME
A	There are **twenty** multiple-choice questions. **All the questions are compulsory.**	20	20 minutes
B	There are **six** questions. Answer **any four** questions.	60	100 minutes
C	There are **three** design questions. Answer **only one** question.	20	60 minutes
	TOTAL	**100**	**180 minutes**

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SECTION A MULTIPLE –CHOICE QUESTIONS [20 marks]

The multiple-choice questions in this section are **all compulsory.** Each question is worth 1 mark.

INSTRUCTIONS FOR MULTIPLE –CHOICE QUESTIONS

1. Circle the letter which represents the **best** answer in the Answer grid provided on **SHEET 4. If you change your mind**, put a line through your first choice and circle the letter of your next choice.

   For example:

1	A	B	C	D

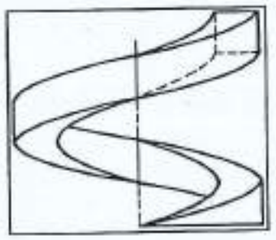
2. **If you change your mind** again and like your first answer better, put a line through the second circle and tick ( ) your first answer.

   For example:

1	A	B	C	D

3. **No mark** will be given if you circle more than one letter for a question.

1. The name of the helix shown on the right is a

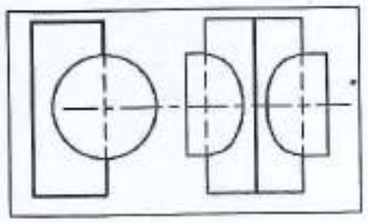


   A. right hand square spring.
   B. right hand square thread.
   C. left hand square spring.
   D. left hand square thread.

2. One way of conservation of our natural resources in engineering is to

   A. continuously change products.
   B. use new materials for new designs.
   C. minimize wastage in design processes.
   D. increase exports to boost economic growth.

3. The diagram on the right shows the intersection of a cylinder to

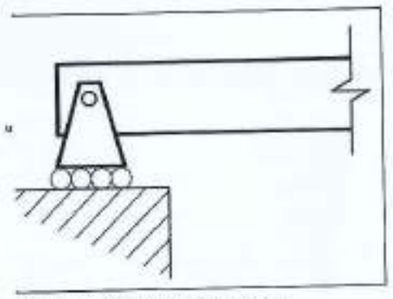


   A. cylinder.
   B. square prism.
   C. triangular prism.
   D. rectangular prism.

4. In course plotting, a beam bearing is usually taken to

   A. clear shallow waters by a certain distance.
   B. locate the ships position by taking two bearings.
   C. alter course by aligning the ship with two collinear points.
   D. alter course when perpendicular to a landmark or obstacle.

5. The beam support shown on the right is known as



Source: https://www.2.bp.blogspot.com

   A. pin support.
   B. fixed support.
   C. hinge support.
   D. roller support.

6. The CAD symbol which represents **copy** is

   A. 
   B. 
   C. 
   D. 

7. The locus of a point lying inside the rolling circle which rolls inside a base circle is called

   A. a superior epitrochoid.
   B. an inferior epitrochoid.
   C. a superior hypotrochoid.
   D. an inferior hypotrochoid.

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8. The centroid of a parallelogram is located by the intersection of its

A. median.
B. latitudes.
C. diagonals.
D. angle bisectors.

9. A professional person who is specialized in estimating the value of construction works in a construction industry is known as a/an

A. Builder.
B. Engineer.
C. Project Manager.
D. Quantity Surveyor.

10. The main disadvantage of a roller follower is that it

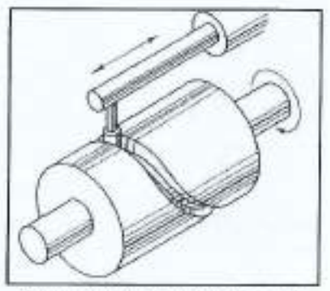
A. requires lubrication.
B. wears out very easily.
C. cannot roll on narrow edges.
D. cannot roll into sharp corners.

11. The centre of curvature of an ellipse is usually located on its

A. vertex.
B. evolute.
C. major axis.
D. minor axis.

12. The cam type shown on the right is called

A. knife-edge.
B. cylindrical.
C. roller.
D. face.



Source: http://www.machinedesign.com

13. Which type of force is exerted on the rope as shown in the picture below?

A. Coplanar, collinear
B. Coplanar, concurrent
C. Non-coplanar, collinear
D. Non-coplanar, non-concurrent

Source: https://www.previews.123rf.com

14. Which of the following AutoCAD Classic commands will produce various types of shape?

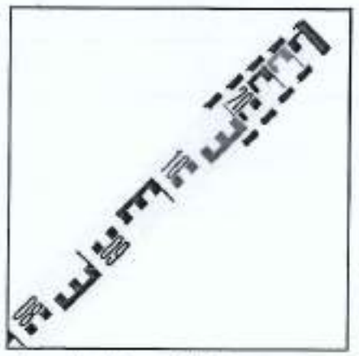
A. Line
B. Spline
C. Ellipse
D. Polyline

15. Which of the following methods would be most appropriate for the surface development of a truncated right pyramid?

A. Angle lines
B. Radial lines
C. Parallel lines
D. Triangulation

16. The surveying and levelling tool shown below is known as

A. staff.
B. spirit.
C. levels.
D. tripod.



Source: https://encrypted-tbn2.gstatic.com

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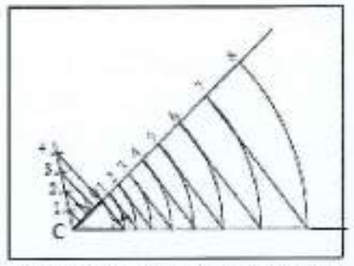
17. The scale shown in the diagram on the right is used to draw a/an

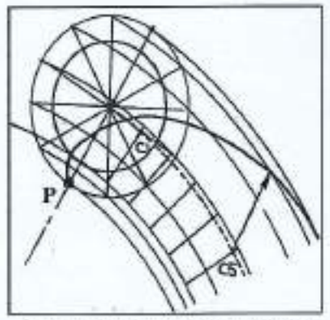
A. helix.
B. conical spiral.
C. logarithmic spiral.
D. archimedean spiral.



Source: Advanced Level Technical Drawing

18. The locus of point **P** on the diagram shown on the right is known as a/an

A. superior trochoid.
B. superior epitrochoid.
C. inferior epitrochoid.
D. superior hypotrochoid.



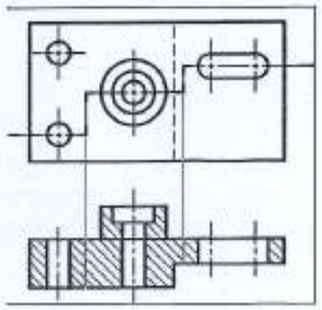
Source: Advanced Level Technical Drawing

19. A working version of a product or system made to resemble, as close as possible, the design intended for manufacture is called a

A. prototype.
B. mock up.
C. sketch.
D. model.

20. The sectional view shown on the right is known as

A. full.
B. half.
C. offset.
D. removed.



Source: https://encrypted-tbn3.gstatic.com

SECTION A MULTIPLE –CHOICE QUESTIONS

Circle the letter that represents the **best** answer.

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D
5	A	B	C	D
6	A	B	C	D
7	A	B	C	D
8	A	B	C	D
9	A	B	C	D
10	A	B	C	D
11	A	B	C	D
12	A	B	C	D
13	A	B	C	D
14	A	B	C	D
15	A	B	C	D
16	A	B	C	D
17	A	B	C	D
18	A	B	C	D
19	A	B	C	D
20	A	B	C	D

20

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SECTION B [60 marks]

There are **six** questions in this section. Answer any **four** questions. Each question is worth **15** marks.

QUESTION 1 (15 marks)

PART A (4 marks)

Given: The elevation of the cone is shown with the apex **O**, point **P** on its axis and cutting planes AA, BB, CC, DD and EE.

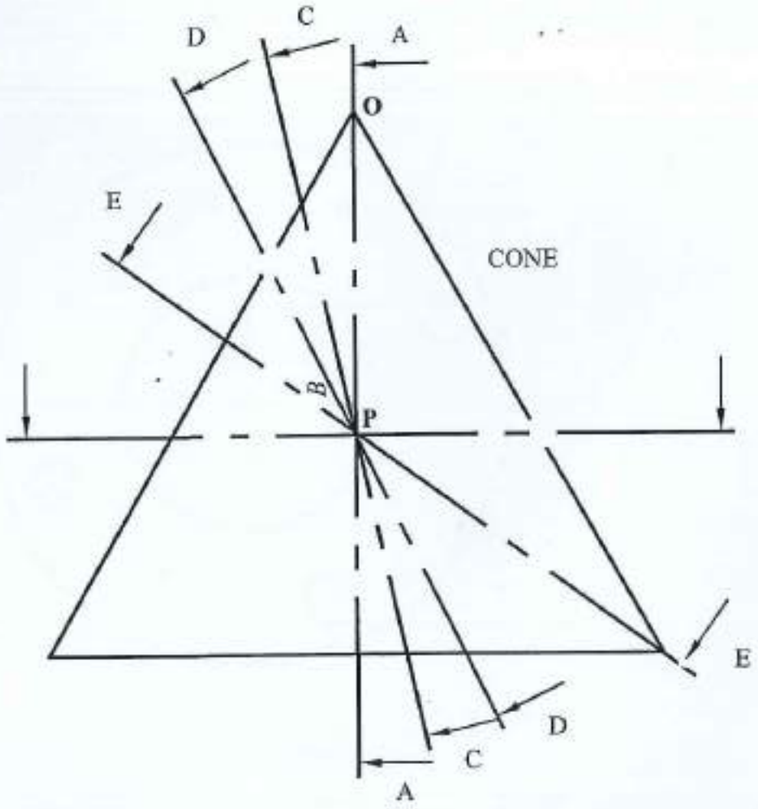
Required: Name the conic section formed by the cutting planes shown.

AA: _____

BB: _____

CC: _____

EE: _____

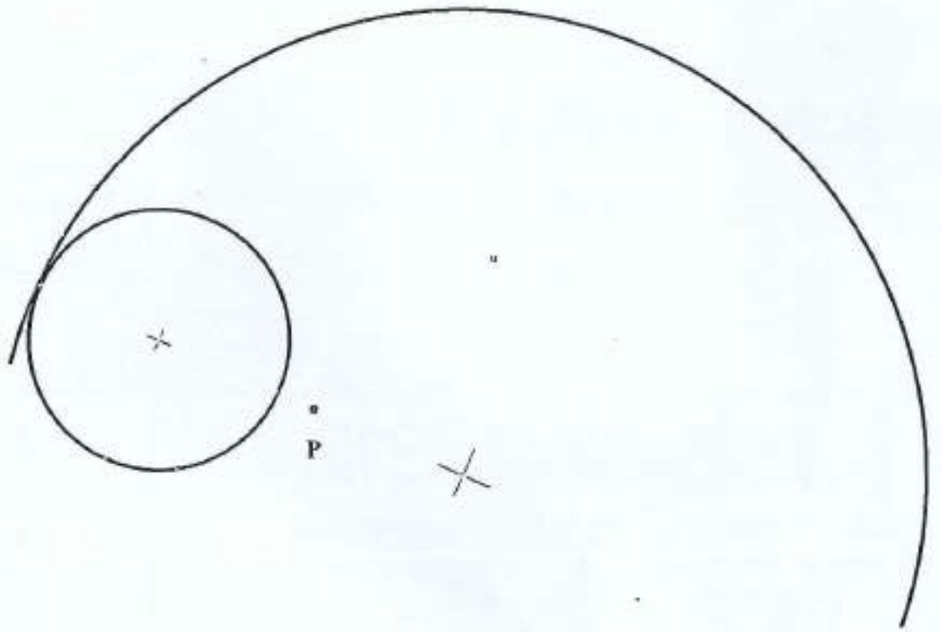


BQ1A			
1	Correct names	2	
2	Correct printing	2	
BQ1B			
3	Accuracy –path divisions, 1 rev, direction	1	
4	Correct shape of locus	2	
5	Correct line work	1	
6	Correct generating lines or method	1	
7	Correct divisions on rolling circle and labels shown	1	
8	Neatness	1	
BQ1C			
9	Correct line work	1	
10	Correct projection lines	1	
11	Accuracy –correct measurements	1	
12	Correct shape of elevation	1	

PART B (7 marks)

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

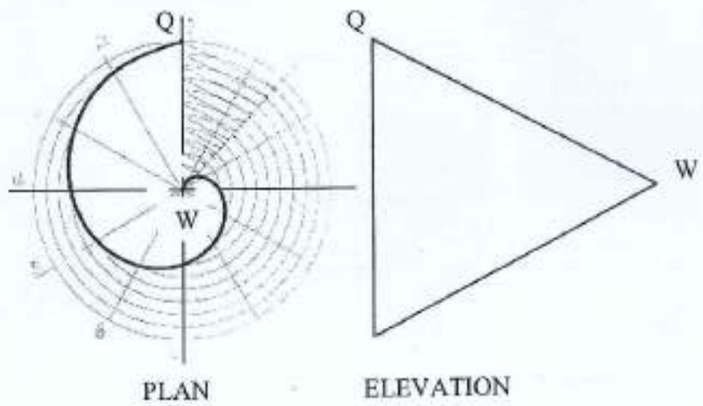
Required: Draw the locus of point **P** outside the rolling circle for ½ revolution.



PART C (4 marks)

Given: A complete plan and an incomplete elevation of a conical spiral in **1st angle**.

Required: Construct the conical spiral in the elevation view.



15

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SECTION B Cont.

QUESTION 2

(a) **Given:** The elevation of an engineering component and a sketch not drawn to scale. **(8 marks)**

Required:

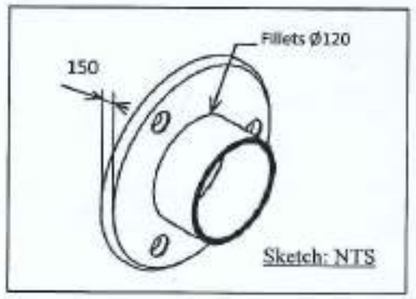
(i) Name the engineering component. _____ **(1 mark)**

(ii) Draw the end elevation using scale 1:10 at starting point A. **(2 marks)**

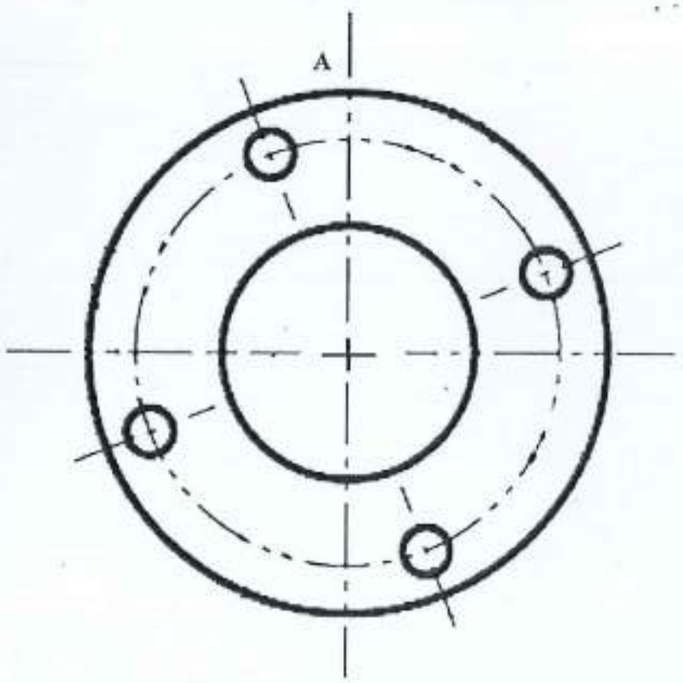
(iii) Show the **break line** for the large hole and the fillets clearly on the end elevation. **(3 marks)**

(iv) Show **one** important dimension on the orthographic drawing. **(2 marks)**

BQ2(a)(i)			
1	Correct identification	1	
BQ2(a)(ii)			
2	Accuracy	½	
3	Correct line work	1	
4	Correct shape of end elevation	½	
BQ2(a)(iii)			
5	Correct symbol of break line for hole	1	
6	Correct line work	1	
7	Accuracy - fillets	1	
BQ2(a)(iv)			
8	Correct dimensioning tech	½	
9	Correct line work	1	
10	Correct dimension	½	



Source: *Form 6 TDD textbook, MoE, 2012*



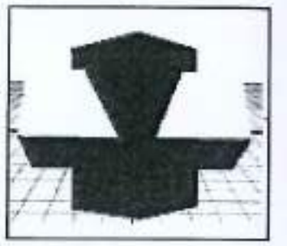
(b) **Given:** The plan, incomplete elevation and end elevation and a sketch of two unequal square section pipes. **(7 marks)**

Required:

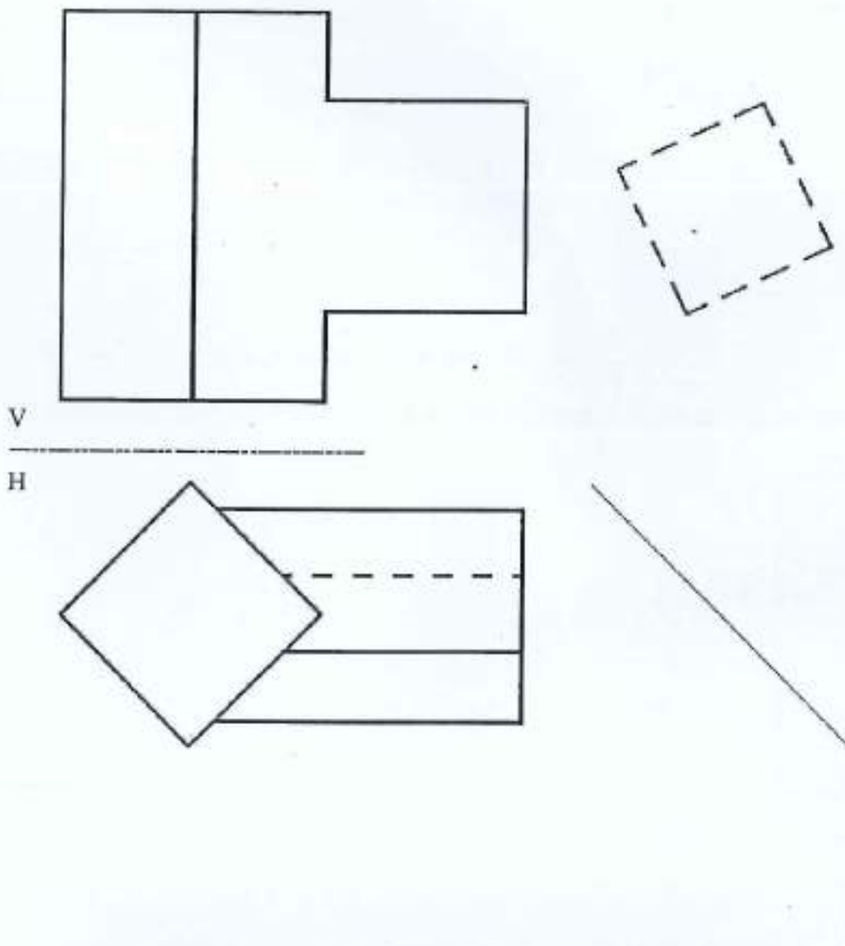
(i) Complete the end elevation. **(3 marks)**

(ii) Complete the elevation to show the intersecting lines. **(4 marks)**

BQ2(b)(i)			
1	All missing lines shown	2	
2	Correct line work	1	
BQ2(b)(ii)			
3	Correct labeling	2	
4	Correct line work	1	
5	Correct intersecting lines	1	



Source: *http://www.slideshare.net*



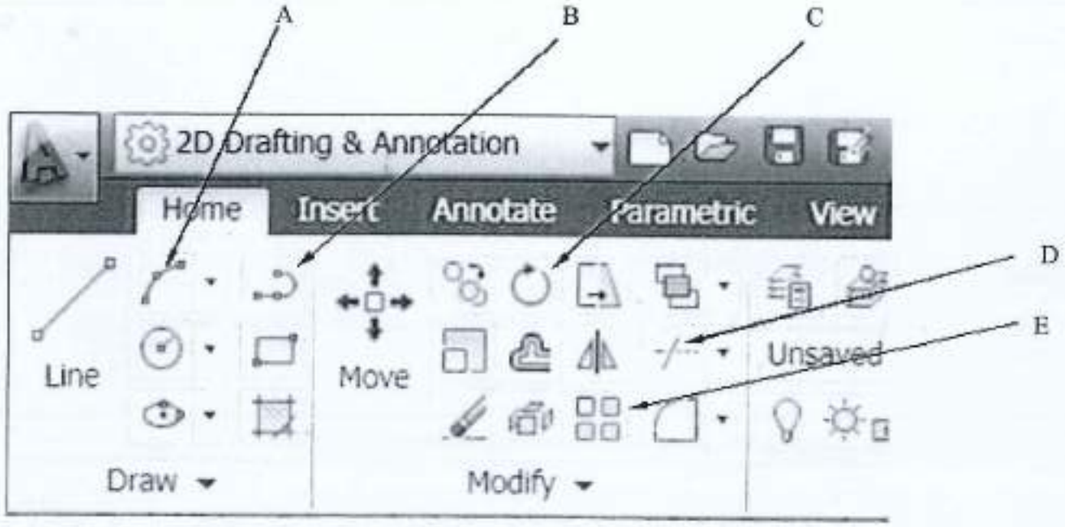
INDEX NUMBER:

SECTION B **Cont.**

QUESTION 3 **(15 marks)**

PART A **(5 marks)**

Given: A **2D** drafting and annotation.



Source: http://labs.autodesk.com

Required: Name the AutoCAD icons A to E.

A: _____

B: _____

C: _____

D: _____

E: _____

BQ3A			
1	Correct names	5	
BQ3B(i)			
2	Correct label of anchor bolt	1	
BQ3(ii)			
3	Correct footing details	2	
4	Correct labels	2	
BQ3C			
5	Accuracy	1	
6	Correct line work	1	
7	Correct shape	1	
8	Correct labelling	1	
9	Correct calculation of scale length	1	

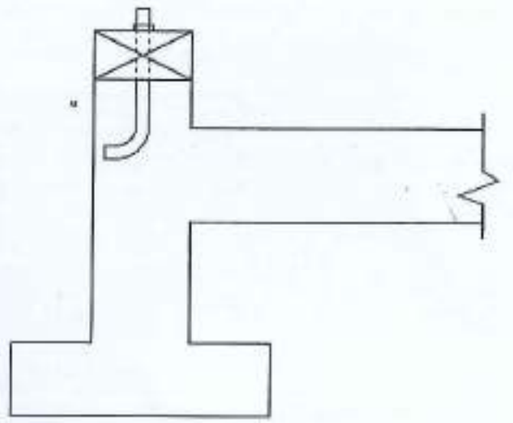
PART B **(5 marks)**

Given: A foundation construction of a typical house section drawn to a scale of 1 : 50.

Required: (i) Clearly label the anchor bolt. **(1 mark)**

(ii) Complete the drawing by inserting the following building components and labels.

1. Hardcore Fill
2. Reinforcement rod **(4 marks)**



PART C **(5 marks)**

Given: The starting lines of a diagonal scale at the bottom.

Required: Construct the diagonal scale of 1 : 25 to read meters and centimeters up to 3 meters.

Calculations:

15

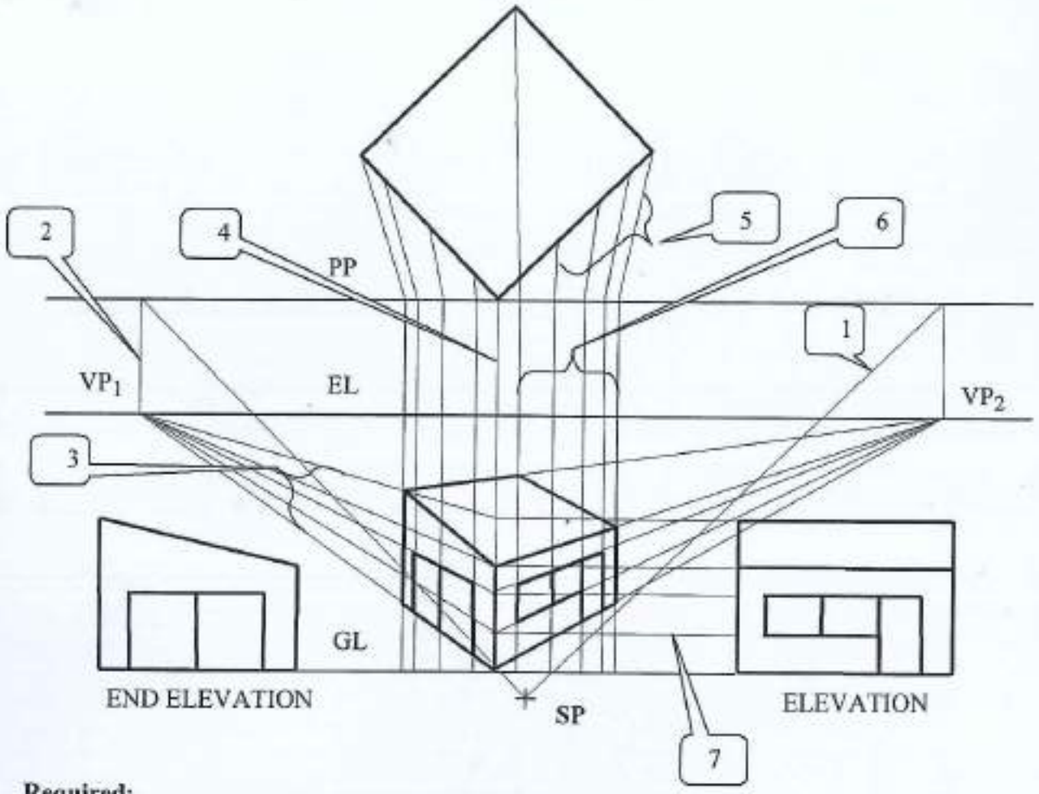
Index Number:

SECTION B Cont.

QUESTION 4 **(15 marks)**

PART A **(7 marks)**

Given: The plan and elevation of a house drawn in **two-point** perspective.



Required:
Write down the **seven** steps indicated on the diagram to construct an instrumental **two-point** perspective drawing of the house.

Step 1 _____

Step 2 _____

Step 3 _____

Step 4 _____

Step 5 _____

Step 6 _____

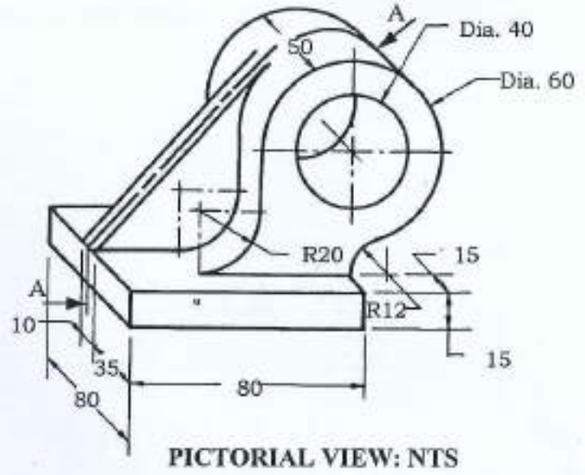
Step 7 _____

BQ4A			
1	Correct 7 steps written	7	
BQ4B			
2	Correct line work	2	
3	Accuracy - fillets	2	
4	Accuracy - tangents	2	
5	Neatness	1	
6	Accuracy –correct measurements	1	

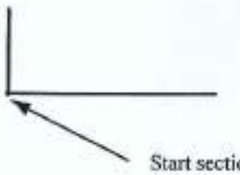
PART B **(8 marks)**

Given: A pictorial view of a machine part shown below.

Required: Draw the Front Elevation in full section on cutting plane A-A.



PICTORIAL VIEW: NTS



Start sectional elevation here

Index Number:

SECTION B Cont.

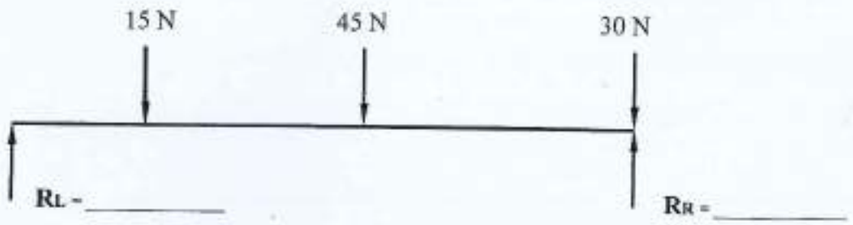
QUESTION 5 (15 marks)

PART A (8 marks)

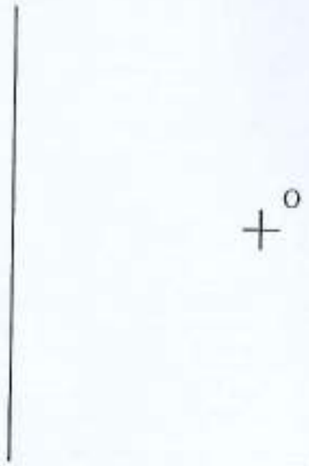
Given: A space diagram of a beam drawn to a scale of 1 : 100.

Required: (i) Complete the space diagram using **Bow's Notation.** **(1 mark)**

(ii) Determine the reactions $\mathbf{R_L}$ and $\mathbf{R_R}$ at the supports graphically. **(7 marks)**



Load line scale 10 mm : 10 N

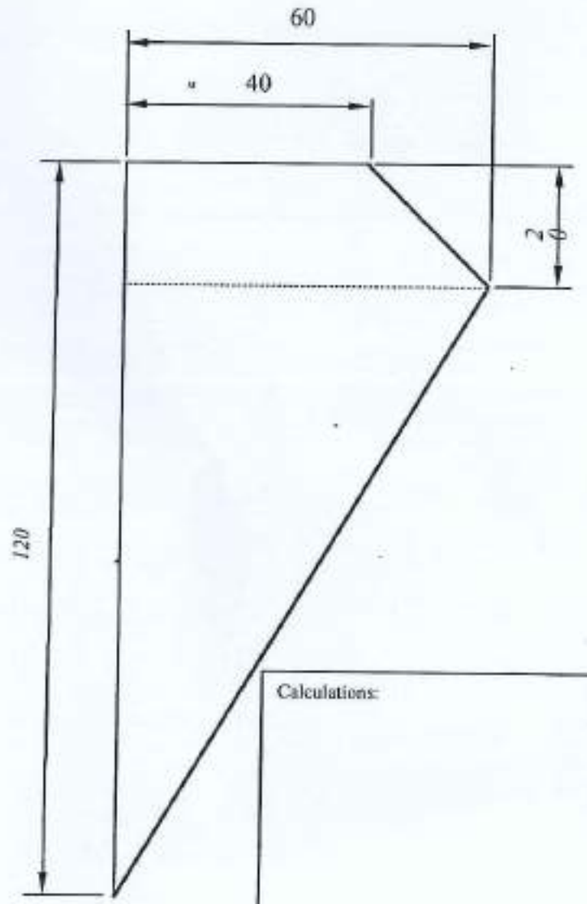


BQ5A(i)			
1	Correct Bows notation used	½	
2	Correct no. of labels shown	½	
BQ5A(ii)			
3	Accuracy –load line	1	
4	Correct polar diagram	1	
5	Correct funicular polygon	2	
6	Correct value of R_L and R_R	2	
7	Correct units shown	½	
8	Neatness	½	
BQ5B			
9	Correct calculation of trapezium area	1	
10	Correct calculation of triangle area	1	
11	Accuracy- Correct position of **C** of trapezium	1	
12	Accuracy- Correct position of **C** of triangle	1	
13	Accuracy- Correct position of **C**	1	
14	Correct method	1	
15	Correct line work	1	

PART B (7 marks)

Given: A composite geometrical shape of a trapezium and triangle.

Required: Locate the centroid by using the ratio method.



Calculations:

15

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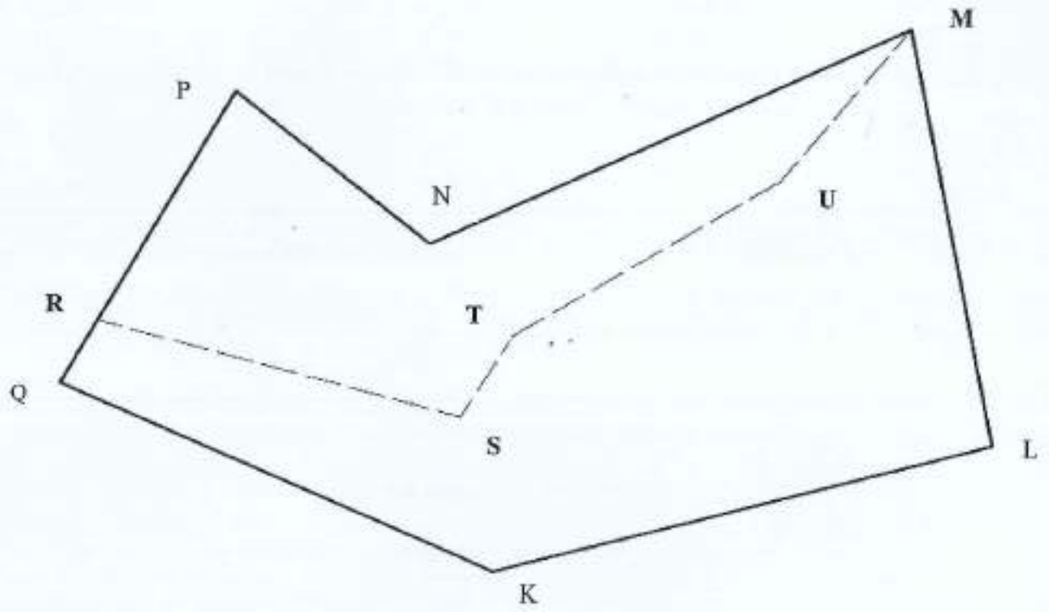
SECTION B **Cont.**

QUESTION 6 **(15 marks)**

PART A **(8 marks)**

Given: A path runs from **R** through **STU** to **M**. The level book gives the staff reading at points **RSTUM**.

Required: Complete the level book calculations and carry out the necessary checks.



LEVEL BOOK

Back sight	Inter sight	Fore sight	Rise	Fall	Reduced Level (m)	Station	Distance (m)	Remarks
5.200					*30.00*	*R*	*0*	*Start*
	2.200				*33.00*	*S*	*61*	*Manhole*
4.000		*1.300*				*T*	*76*	
	4.500					*U*	*128*	*Manhole*
		5.900				*M*		*Finish*

PART B **(7 marks)**

Given: An incomplete Electrical Plan of Farhan'sProposedHouse.

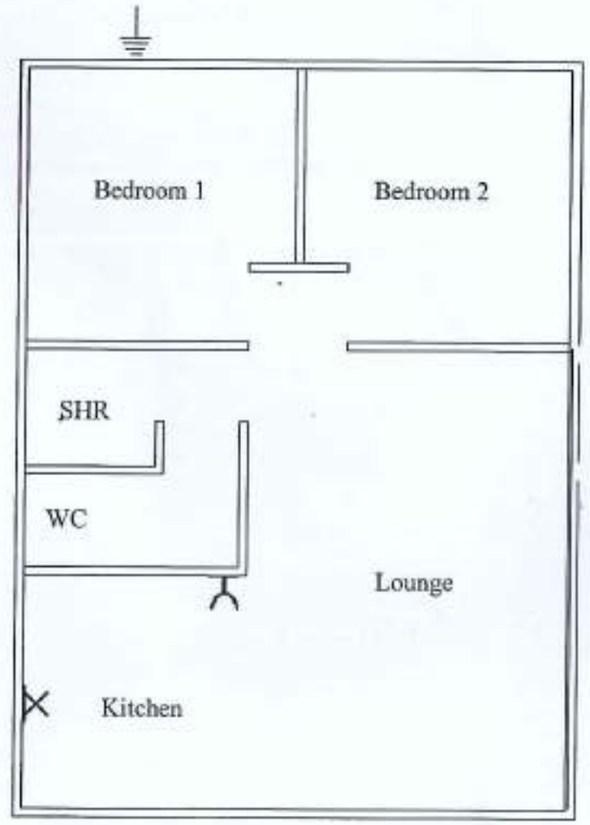
Required: (i) Insert the following symbols:

(a) Distribution Board on the lounge wall
(b) Socket outlet with a switch in Bedroom 2 wall
(c) Two way switch in Bedroom 1 wall
(d) One Fluorescent lamp in Bedroom 2
(e) Single door in Bedroom 2

(ii) Label the following symbols:

(a) Wall mounted lamp
(b) Earth

BQ6A			
1	Correct Rise and Fall filled	4	
2	Correct Reduce levels filled	3	
3	Correct Remarks filled	1	
BQ6B(i)			
4	Correct symbols shown	5	
BQ6(ii)			
5	Correct labels	1	
6	Correct printing	1	



INDEX NUMBER:

SECTION C [20 marks]

Answer only one question out of the three questions given.
Write the question number you have chosen in the box provided on Sheet 14.

EITHER

QUESTION 1 (15 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.

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 used

(ii) ergonomic considerations

(4 marks)

(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)**

INDEX NUMBER:

SECTION C (continued)

OR

QUESTION 2 **(20 marks)**

Problem: Many patients in the hospital find it difficult to sit up in their beds to eat the food set on their bedside tables. This has posed a major problem to nurses and caregivers to feed their patients and make them well.

Brief: Design a food trolley that is easily adjustable for caregivers and nurses to feed their patients.

Specification:

The food trolley should:

1. be affordable;
2. be light and easy to construct;
3. be portable and can be easily moved around freely to designated areas;
4. have a mechanism to raise and lower the trolley table and;
5. be completely safe for the user.

Requirements:

(a) Produce **two** freehand pictorial sketches of the food trolley. **(8 marks)**

(b) Evaluate each sketch on the following basis:

(i) materials used

(ii) ergonomic considerations

(4 marks)

(c) Explain with the help of sketches how the mechanism enables the lowering and raising of the trolley table. **(3 marks)**

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

INDEX NUMBER:

SECTION C (continued)

OR

QUESTION 3 (20 marks)

Problem: During the night, students find it difficult to study in their homes since they feel they will distract their family from sleep. Therefore, some students prefer to study late or very early in the morning to ensure minimum distractions and disturbances to their family members.

Brief: Design a study lamp with a shade to illuminate the immediate study area; helps to promote ease of reading, writing and drawing and reduces eye strain on the user.

Specification:

The study lamp should be:

1. portable and powered by renewable energy;
2. affordable and environment-friendly;
3. made from locally available materials;
4. safe for the user; and
5. neat and attractive.

Requirements:

(a) Produce **two** freehand pictorial sketches of the study lamp. **(8 marks)**

(b) Evaluate each sketch on the following basis:

(i) materials used

(ii) ergonomic considerations

(4 marks)

(c) Draw the electrical circuit arrangement of the study lamp. **(3 marks)**

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

QUESTION

Index Number:

(a)Possible Solution 1 **(4 marks)**

1	Pictorial Crate/Box used	1		3	Correct labels	1	
2	Correct line work	1		4	Correct proportion	1	

Possible Solution 2 **(4 marks)**

1	Pictorial Crate/Box used	1		3	Correct labels	1	
2	Correct line work	1		4	Correct proportion	1	

(b)

Criteria	Possible Solution 1 **(2 marks)**	Possible Solution 2 **(2 marks)**
(i) Materials		
(ii) Strength		

(c) **(3 marks)**

1	Overall neatness and clarity of sketch(es)	1		3	Evidence shown	1	
2	Relevant explanations and labels given	1					

(d) **(5 marks)**

1	Overall neatness and clarity of sketch	1		3	Correct rendering shown	1		5	Correct line work	1	
2	Correct labels	1		4	Correct proportion	1					

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